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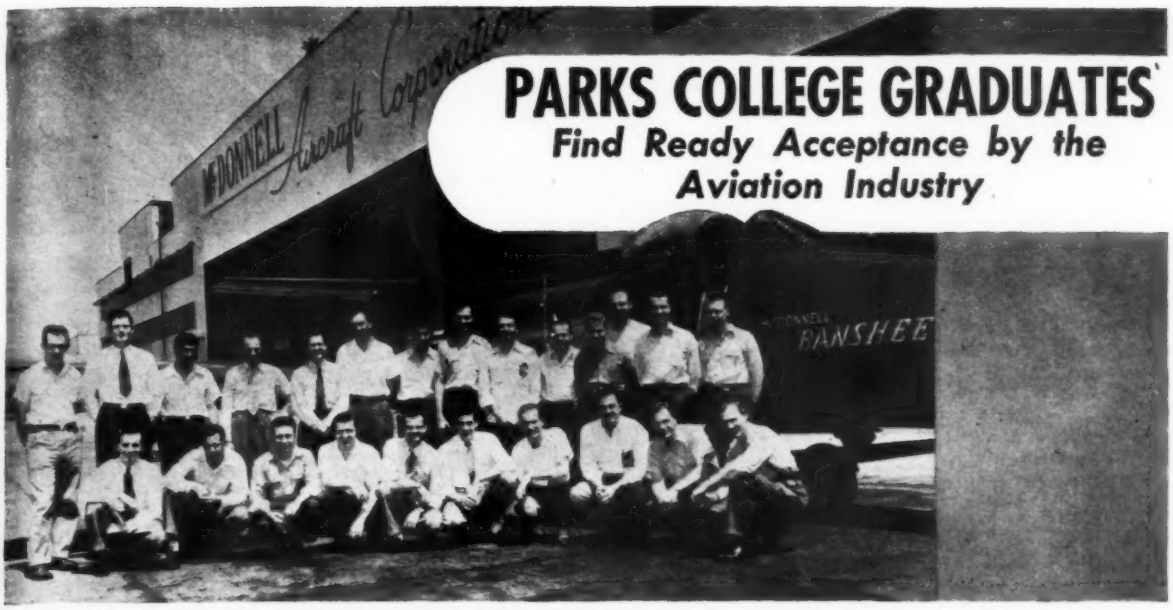

PARKS COLLEGE GRADUATES
Find Ready Acceptance by the Aviation Industry

This View of Parks Graduates Now Employed by McDonnell Aircraft is Typical of their Acceptance by the Aviation Industry

Parks College graduates who are doing such a fine job on engineering drafting boards and on the production line at McDonnell Aircraft are shown here in front of the Banshee, which they helped design and build. They are (from left, kneeling): T. S. Lindabury, assistant design engineer; A. W. Courtial, Jr., layout draftsman; Alex Maruniak, senior detailer; W. G. Loveridge, Jr., weight engineer; N. Semerak, assistant stress analyst; C. Adriance, aerodynamicist; H. Brush, senior detailer; H. P. Churchill, Jr., layout draftsman; E. Painter, senior detailer; and G. Telfair, project administration engineer. Standing are (from left): A. Aldrich, flight test; J. W. Flournoy, assistant design engineer; A. Amerigan, aerodynamicist; L. R. Novak, assistant project engineer; H. J. Trembley, layout draftsman; A. E. Ostroff, assistant design engineer; H. Ostroff, assistant design engineer, helicopter; R. A. Thorpe, layout draftsman; C. Sadler, assistant design engineer; R. M. Rowland, stress analyst; H. Keltto, loftsman; B. H. Kloster, stress analyst; M. Broschak, loftsman; and F. W. Egner, Jr., stress analyst. Many other Parks graduates at McDonnell Aircraft Corporation could not be contacted when the picture was made.

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FEBRUARY 1948 VOL. XXXVIII No. 2

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LATEST WEAPON for attack on the sonic barrier—and the most promising to date—has been revealed as a combination turbojet and rocket powered version of the Douglas D-558 *Skystreak*, which already holds the world's speed record. The new Douglas D-558-2 features swept wings and tail, a long razor-sharp pointed nose, and sleek smooth lines that all but guarantee its attaining sonic speed. With only 25 ft. span the new craft is more than 45 ft. long. It is powered by a conventional Westinghouse 24C turbojet engine for taking off and climbing to a 30-40,000 ft. altitude. But then the power of a Reaction Motors rocket engine, similar to the one installed in Bell XS-1, is let loose and the attack on the barrier of sonic speed is on!

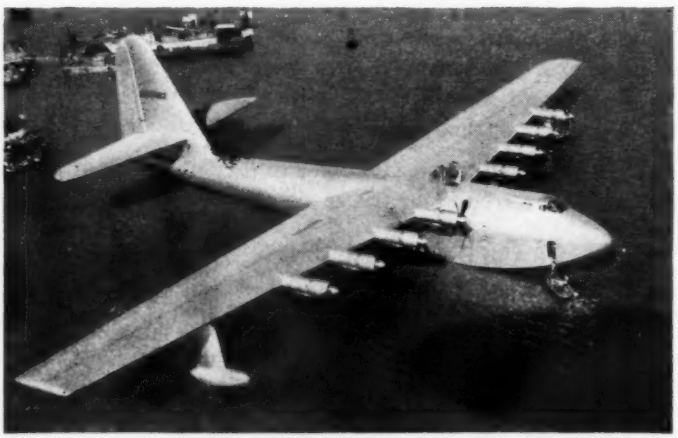
IT'S ALWAYS A PLEASURE to report another Air Force contract and this time the recipient is Fairchild Aircraft for 37 model C-119 at a price of $22,000,000. The new C-119 is a modified C-82 *Packet* powered by 3250 hp Pratt & Whitney Wasp Major engines. It features a pilot's cabin in extreme nose of the ship, replacing the former location high atop the bulky fuselage where vision proved difficult during landing. The new *Packet* is faster (by 17 mph), bigger (by 14 in. in width and 5 ft. in length) and heavier (by 10 tons), and the Army Ground Forces are more and more interested in the big ships as paratrooper carriers. For this job the new *Packet* has an exit for paratroopers up forward in the belly to permit chute jumpers to leave forward while other jumpers or heavy guns or equipment is going out the big doors in the rear simultaneously. Fairchild's C-82 *Packet*, equipped with the radical tractor gear, will be flying as you read this.

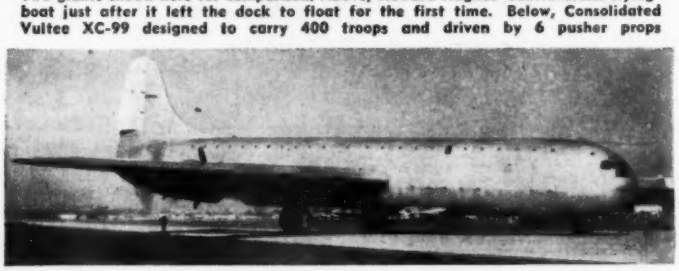
SWEPT WING North American XP-86 has successfully completed Phase I (company pilots) test flights and turned over ship to Air Materiel Command for combat test flying. Production on the jet fighter is slated to begin after the first of the year. Air Force believes this will prove the fastest service jet fighter in the world after minor bugs are removed. NA appears in substantial form in the production lineup of the industry with all its recent projects: Air Force B-45 four jet bomber, Navy FJ-1 jet fighter; and Air Force P-86 jet fighter all ordered for quantity production. NA also has three others upcoming.

GIANT CONVAIR XC-99 got off on its first test flight successfully and remained aloft for more than one hour over San Diego, Calif. The huge 132-ton craft, largest landplane ever built, can carry 400 troops with full equipment at cruising speed of 220 mph. Transport version of the B-36 bomber, the XC-99 also can fly 10,000 miles with 10,000 lbs., basic specification requirement. Only one will be built, the commercial CV-37 having been abandoned.

GRUMMAN'S NEW XJR2F-1 amphibian, 25,000 lb. version of the basic Grumman amphibian, has been revealed. Expanded version of the commercial *Mallard*, which it strongly resembles, the new Navy utility

(Continued on page 71)





Two giants shown here for comparison. Above, Howard Hughes' controversial flying-boat just after it left the dock to float for the first time. Below, Consolidated Vultee XC-99 designed to carry 400 troops and driven by 6 pusher props

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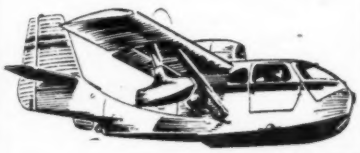

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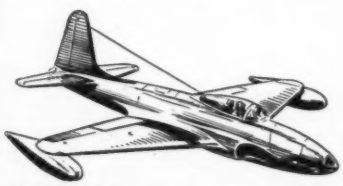

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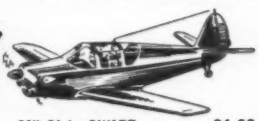

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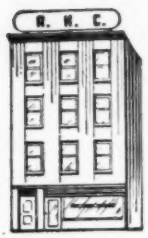

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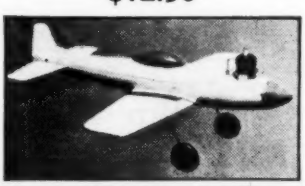

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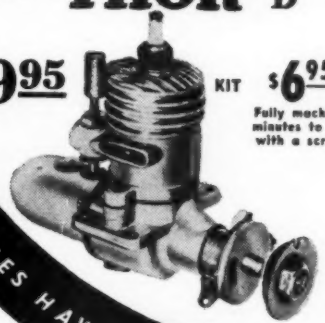

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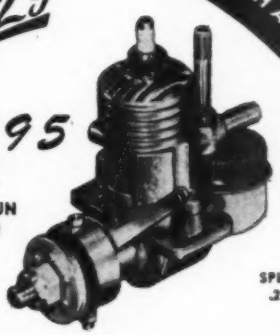

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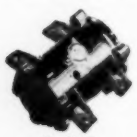

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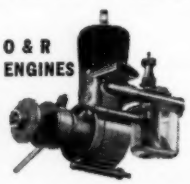

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SCRAP BOX
BY BILL WINTER

TO lead off with the $64 question; what is an expert? Twenty years ago this would have been an easy one to answer. Anyone who could make a model fly was an expert. But it isn't quite so simple today. For, if an expert is a chap who knows all phases of modelling, then there probably are no experts. An occasional Korda or a Goldberg comes pretty close, but by and large we are becoming a bunch of specialists. In those dear dead days when rubber was kingpin, we built twin-pushers, various sticks, fuselages, and flying scale. Pretty soon indoor flying had produced the microfilm floaters; and then came gas free flight, control line, CO-2, and too many variations in hydro, ornithopters, helicopters, radio control, towliners, etc., to bear mentioning. (Say, whatever became of compressed air?) Why, a man can't keep informed on what goes on, much less find time to build and fly every type of model that comes along!

* *

From the windy city of Chicago comes news of still another wrinkle; the control line CO-2. At a Halloween exhibit put on by the *Chicago Aeronuts* for the Western Electric Flying Club a hotly contested event was CO-2 speed, flown on .003 tungsten wires at speeds between 33 and 34.7 mph. Chicago, as a matter of fact, has been bearing down on CO-2. In free flight, wing areas of between 120 and 130 sq. in. are proving ideal. Construction and performance is generally similar to rubber, but thanks to intensive prop development, and tricky ways and means of getting more out of a capsule, there are some models that outshine the best gassies on the first burst of power. 3 to 3½ oz. weight seems average with fuselages hollowed out of balsa blocks or built up from 1/32" sheet. Slightly undercambered prop blades and equal pitch and diameter of 8" so far proves best. The *Aeronuts*, incidentally, pulled a stunt in their exhibit that would seem to have swell possibilities for indoor flying anywhere. The exhibit was more of a show than a contest, featuring flights of helicopters, ornithopters, autogyros, CO-2, flying scale, gliders, and miscellaneous sport jobs.

* *

Speaking of strange types of models, we have this story from Cal Smith whose mouth, when we last saw him, was still hanging open. Cal is an aeronautic advisor to an Air Scout group on the Jersey shore. Noting that the boys ate up anything connected with model building, Cal arranged a display of gas models. The boys went wild. They had never seen a free-flight model! Better look out for those new fangled free flight jobs. Probably some new fad.

* *

Something more than a fad is the Glo-plug. As this is written, the idea is getting a tentative tryout in many cities, with reactions ranging from conservative admissions that the blame thing works to so far unsupported claims that it will upset various applecarts. For our part, we can't help but note that new products have a way of taking their place beside the old with everyone being happy. H. A. Thomas reports that the Glo-plug has equalled top speed times in Little Rock on *Hornets* and *McCoys*. Houston is experimenting with these plugs on *Doolings*. There is even a wild, wild rumor that some Bostonian forgot about indoor models long enough to do 144 mph. with a Glo-plug. If this turns out to be true, we hate to see what Cali-

(*Turn to page* 43)

Gismoe

Try this '47 Nationals winner as a change from the usual pylon types

by Jerry Brofman

IN 1941 the pylon type model was at the peak of its popularity. Now, over six years later, the design of gas models has evidenced little change, if any.

Being a firm believer in the low C.L.A. deep belly type of model, I designed *Gismoe* with the hope of proving that this type of model can perform as well, if not more satisfactorily, than the pylon type. At the last Nationals this fact was well demonstrated. On three flights during a day that decidedly lacked thermals, *Gismoe* flew for a total of over 21-1/2 minutes to win first place in the Class C Open Gas Event.

You will notice that *Gismoe* incorporates in its design an extremely low slung belly, with its C.L.A. behind the wing trailing edge, along with a comparatively short nose moment and long tail moment. This arrangement has been found to produce excellent aerodynamic results, especially with the tremendous power of the new postwar engines. The ship has been successfully flown with a *Madewell .49*, *McCoy .49*, *Super Cyclone* and *McCoy .60*. At the Nationals the *Super Cyclone* powered *Gismoe* to first place.

"Nuff" said for now—let's get down to building. Before you start actual construction of the model be sure you have scaled up the plans accurately. This is best done with a scale rule and a pair of dividers.

FUSELAGE—The fuselage is built from 1/4" sq. hard balsa, in the conventional box method. Begin by building both sides on top of each other. When dry, remove sides and join together using the top view as a template. Bend the landing gear of 3/32" steel wire and bend to the firewall, which is made of 1/8" plywood (be sure to put the wheel on first). Cement this assembly in its place on the fuselage. The 1/4" sheet balsa cowl sides are now cemented into position, with the cowl block between them. While this is drying, the side and bottom stringers may be cemented in place.

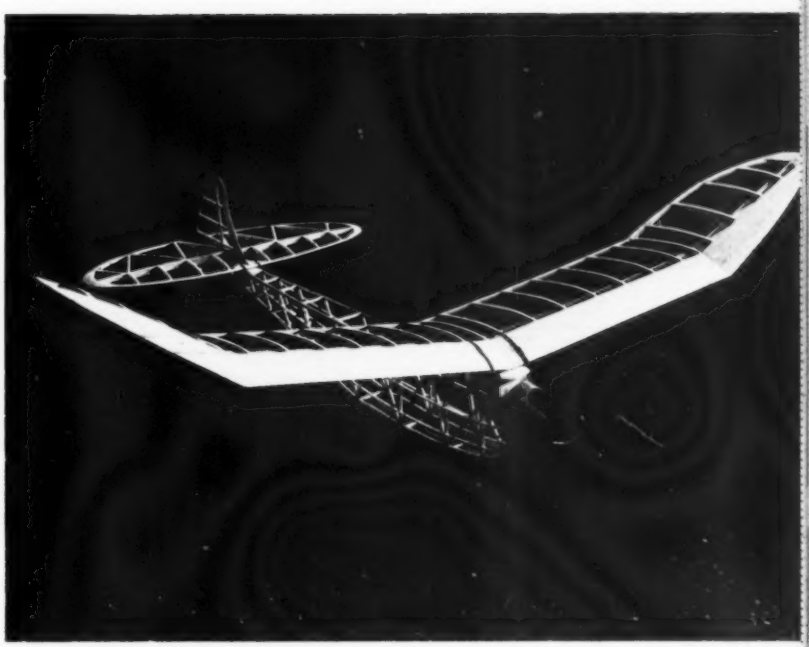
Carve the cowl to its streamline shape as shown on the plans and reglue the entire framework. When dry, shave off all excess balsa and sand same to smooth finish.

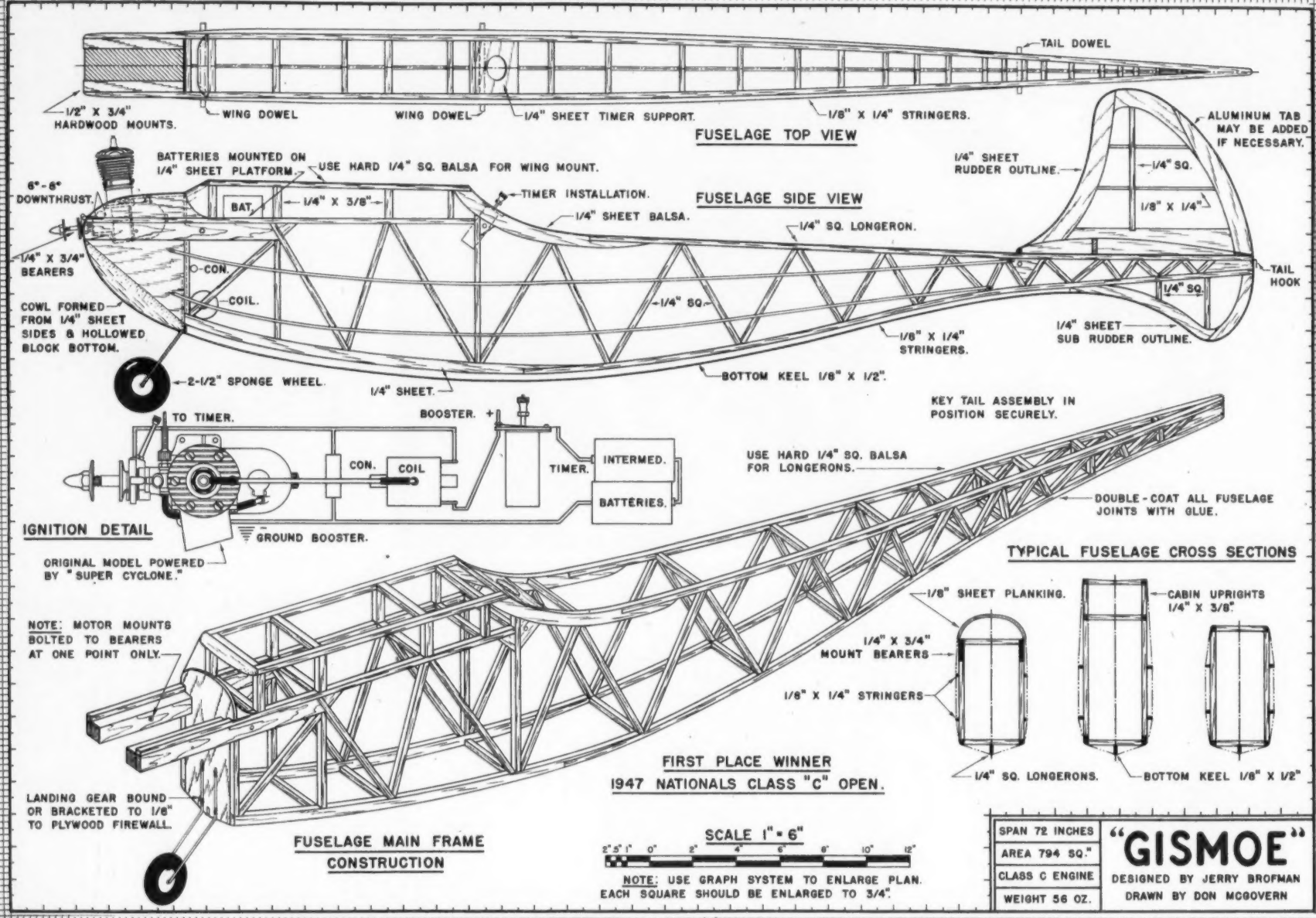
The fuselage is now ready for installing the ignition system. The plans show the places of the ignition components for balance with the *Super Cyclone* engine—for an engine of different weight, balance the airplane at a point 50% back of the wing leading edge.

Use multi-stranded, coated, fuel proof wire; and solder all joints. The more work put into an ignition system the better the final results.

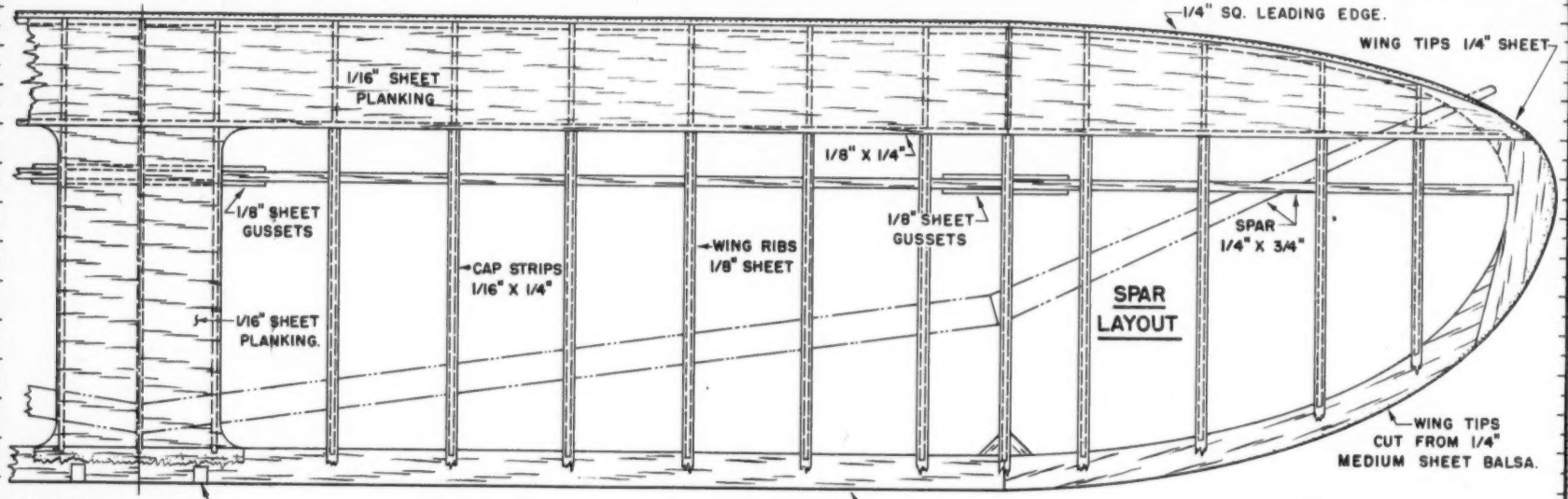
WING—Sheet balsa leading edge and cap-stripped ribs are the keynotes of the wing construction. This type of construction has been found to produce a wing with an exceptionally

(*Turn to page* 68)

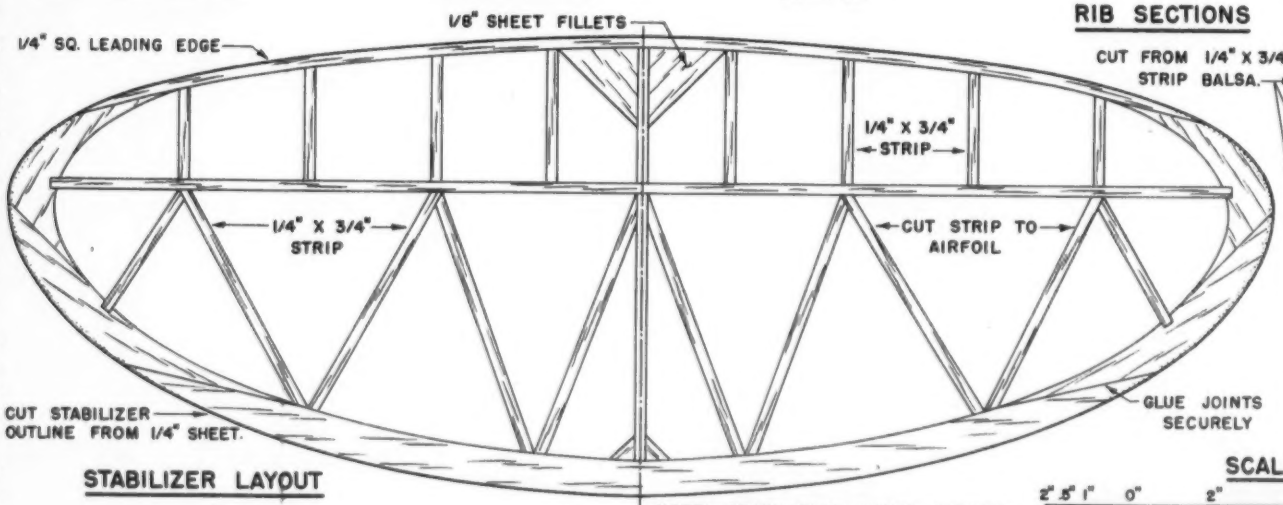



TAIL DOWEL
1/2" X 3/4" HARDWOOD MOUNTS.
WING DOWEL
WING DOWEL
1/4" SHEET TIMER SUPPORT.
1/8" X 1/4" STRINGERS.
FUSELAGE TOP VIEW
ALUMINUM TAB MAY BE ADDED IF NECESSARY.
BATTERIES MOUNTED ON 1/4" SHEET PLATFORM.
USE HARD 1/4" SQ. BALSA FOR WING MOUNT.
1/4" SHEET RUDDER OUTLINE.
1/4" SQ.
1/8" X 1/4"
6°-6° DOWNTHRUST.
BAT.
1/4" X 3/8"
TIMER INSTALLATION.
FUSELAGE SIDE VIEW
1/4" SHEET BALSA.
1/4" SQ. LONGERON.
1/4" X 3/4" BEARERS
CON.
COIL.
TAIL HOOK
1/4" SQ.
COWL FORMED FROM 1/4" SHEET SIDES & HOLLOWED BLOCK BOTTOM.
1/4" SQ.
1/8" X 1/4" STRINGERS.
1/4" SHEET SUB RUDDER OUTLINE.
2-1/2" SPONGE WHEEL.
1/4" SHEET.
BOTTOM KEEL 1/8" X 1/2".
KEY TAIL ASSEMBLY IN POSITION SECURELY.
TO TIMER.
BOOSTER. +
CON.
COIL
TIMER.
INTERMED.
BATTERIES.
USE HARD 1/4" SQ. BALSA FOR LONGERONS.
DOUBLE-COAT ALL FUSELAGE JOINTS WITH GLUE.
IGNITION DETAIL
GROUND BOOSTER.
ORIGINAL MODEL POWERED BY "SUPER CYCLONE."
TYPICAL FUSELAGE CROSS SECTIONS
1/8" SHEET PLANKING.
CABIN UPRIGHTS 1/4" X 3/8".
1/4" X 3/4" MOUNT BEARERS
1/8" X 1/4" STRINGERS
NOTE: MOTOR MOUNTS BOLTED TO BEARERS AT ONE POINT ONLY.
1/4" SQ. LONGERONS.
BOTTOM KEEL 1/8" X 1/2"
FIRST PLACE WINNER
1947 NATIONALS CLASS "C" OPEN.
LANDING GEAR BOUND OR BRACKETED TO 1/8" TO PLYWOOD FIREWALL.
FUSELAGE MAIN FRAME CONSTRUCTION
SCALE 1" = 6"
2" 5" 1" 0" 2" 4" 6" 8" 10" 12"
NOTE: USE GRAPH SYSTEM TO ENLARGE PLAN. EACH SQUARE SHOULD BE ENLARGED TO 3/4".

SPAN 72 INCHES	"GISMOE"
AREA 794 SQ."	DESIGNED BY JERRY BROFMAN
CLASS C ENGINE	DRAWN BY DON MCGOVERN
WEIGHT 56 OZ.	

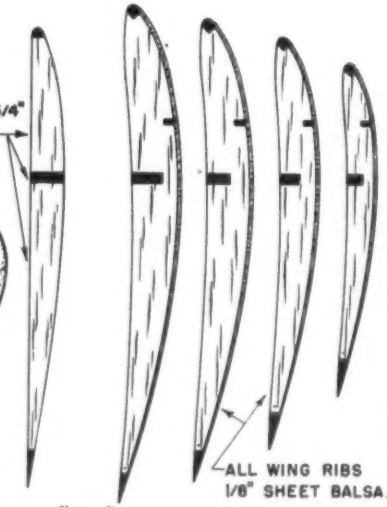


WING LAYOUT

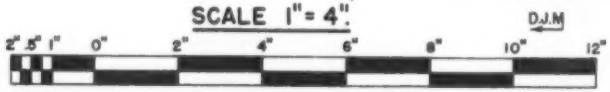

1/8" SHEET FILLETS
1/4" SQ. LEADING EDGE
1/4" X 3/4" STRIP
1/4" X 3/4" STRIP
CUT STRIP TO AIRFOIL
GLUE JOINTS SECURELY
CUT STABILIZER OUTLINE FROM 1/4" SHEET.

STABILIZER LAYOUT

RIB SECTIONS



SCALE 1" = 4".



D.J.M

NOTE: GRAPH PLAN USING MARKERS, AND ENLARGE SQUARES TO 1/2".

Testing Gas Models

by Peter M. Bowers

Fig. 1 Check surfaces for freedom from warpage before tests

Fig. 4 Increase push so model rises not exceeding waist height

Fig. 5 Model must be launched at proper gliding angle and speed

THE most important period of a gas model's life is the first 20 seconds of its first flight. If it pulls through this safely, its chances for a long career are good. Of course it takes a lot of flying to bring a ship to the peak of performance, and much experiment and adjustment; but it is a sad fact that altogether too many promising designs never get a chance to prove themselves, washing out completely on their first flight because of some unnoticed error in design or adjustment.

A carefully planned testing procedure will catch any of those crash-causing faults that may be present in a new design, and they can be corrected before any damage is done. It is a strange thing, but most of the instructions given for building gas models from magazine or kit plans give this all-important step barely a paragraph, if they mention it at all. The procedure outlined is one the author has used with nearly all of his own 25 gas models, as well as with dozens of other models spread over a period of eleven years; he has found it to be almost foolproof. The only time he cracked up ships on test hops was when he did not practice his own preaching! While intended primarily to get new ships over that rough first flight, the system is also a good one to apply to any model, no matter how well flown, if it has been in storage for any length of time, or if it has undergone repairs that might affect its flight characteristics. A few minutes spent in checking out your ship carefully may well save you hours at the repair bench.

The first thing to do before you leave home is to check the model carefully for proper alignment of all surfaces. Make sure the wings are properly seated, and that they will retain their position under the vibrations of the wide-open engine. If the tail surfaces are removable pay special attention to them, for being at a much greater distance from the center of gravity than the wing their effect on the model when moved slightly from their proper position is much greater. Trim tabs should be checked not only for alignment but for security of position. These are usually of sheet balsa, held to the trailing edge of the rudder by sheet aluminum or wire hinges and are merely bent to the desired angle. This is a simple but by no means safe method. Some suitable lock should be provided, although not a model in a hundred will have one. A screw and nut arrangement is best, and one that can be adjusted to micrometer fineness; but for the majority, even a pin forced through the tab and into the trailing edge of the rudder is better than nothing. The tab should be checked after each flight—especially if the ship has nosed over or has had a rough landing—and every time it is assembled. Too much tab one way or the other can cause a deadly power spin, yet the tab is one of the most neglected parts of the plane.

Warps too do their vicious work largely unnoticed, the blame for the crash generally being laid to something else. A one-degree warp, when spread over half the span of a wing, is hard to notice, but unless recognized it can and often does wreck the model. In checking for warps, each surface should be examined separately. Careful sighting by eye along surfaces that are supposed to be straight will reveal any misalignment. The incidence of opposite wing panels can be checked one against the other by laying one panel flat on the floor or on a table, and putting a book under the opposite panel in a chordwise direction. Any differences in the angle of incidence will be readily apparent.

After checking each surface separately, assemble the ship and check it as a whole, paying special attention to incidence of the wings. This can be checked visually by standing off a short distance from the nose or tail and sighting both wing panels from the same point. This after-assembly check is quite important, for it is easy to force a warp into the wings through having an uneven wing mount. If both sides of the mount are not in line the pressure of the rubberbands that hold the wing will force it into the uneven mount, and

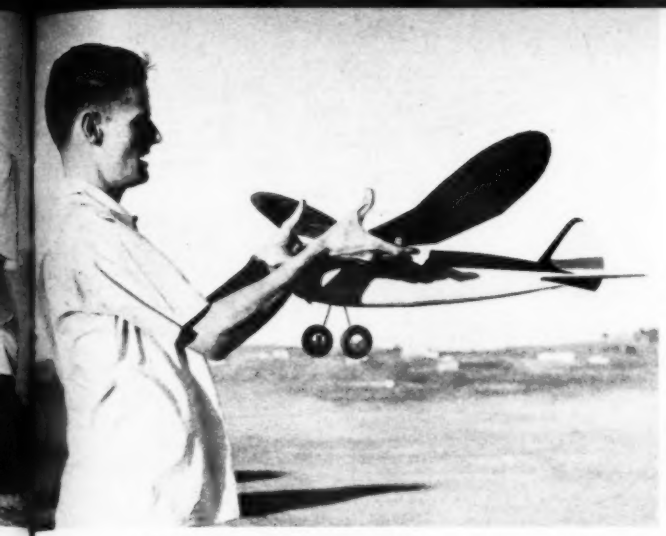


Fig. 2 Balance model on fingertips under ribs near centersection

Fig. 3 Give model gentle push with prop in a horizontal position

Fig. 6 After push and glide tests, model is ready for low power flight

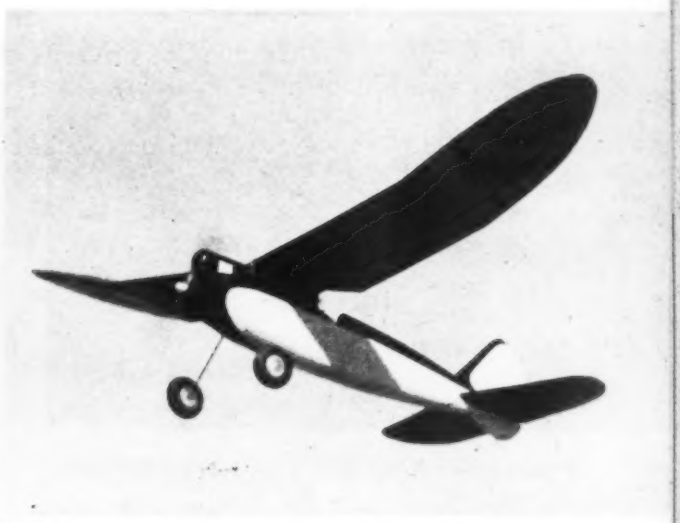


Fig. 7 Previous tests assure success when motor is opened up

a difference in incidence angles of the two wing panels will result.

The last thing to check before actual flight testing begins is balance. On most symmetrical tail models, the center of gravity—or point at which the ship balances—should be about 1/3 of the wing chord from the leading edge. On lifting tail designs it should be a bit farther aft, sometimes as far as the mid-chord point. Most model designs make provision for trimming by moving part of the electrical system—either coil or battery—but diesel jobs will have to use ballast.

When balancing the ship, support it by the wingtips as is commonly done. While most models have a pretty good safety factor, wingtip support puts maximum stress on the centersection splice in the form of a concentrated load, while in actual flight the load is distributed along the whole wing. Balance the model on the tips of your index or forefingers, which should be placed under a rib near the centersection on each side of the wing. This will check for fore-and-aft trim. Lateral trim, or wing heaviness should be checked first with the wing alone, then with it on the ship, which is supported by the prop hub and tailskid, or some convenient point on or near the tail. The fact that the model may be in an upside down position during this test will not affect its outcome. The two wingtips should be level with one another. Add ballast or dope to the light side, and don't sand the heavy side if in so doing you decrease the area of the tip.

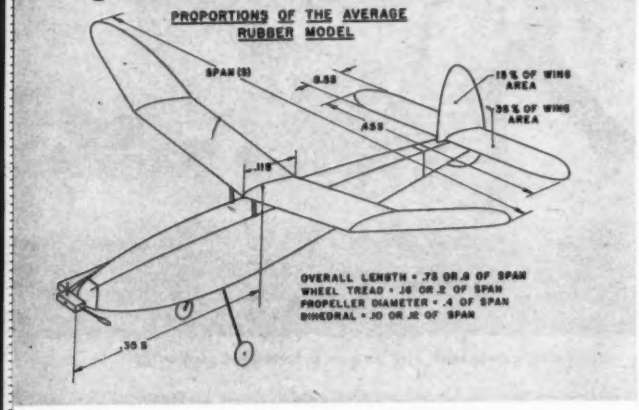
Once the alignment and balance have been attended to, the model is ready for the flight test stage. Contrary to many of the instructions given in the last paragraph of model building, this is not accomplished by throwing the model overhand into tall grass but is carried out on the smoothest open area you can find. When satisfied that the model is properly assembled and balanced set it on the ground facing the wind, which for best results should not be over 5 mph, give it a gentle shove forward with your hand. If all is well it should raise its tail slightly and roll forward in a straight line. Repeat a number of times, giving harder and harder shoves until the ships gets its wheels off the ground and becomes airborne for a few feet. Careful attention paid to the model's performance at this stage will reveal any potentially dangerous faults and they can be corrected on the spot. If the tail comes up but the main wheels won't leave the ground, the ship is either nose heavy or needs a bit of incidence added to the wing. If the tail stays on the ground while the front wheels try to hop off, it is either tail heavy or has too much incidence. A tendency to drop either wing indicates that the low wing is heavier than the high one, or that there is a warp present on one or both panels. Correction of wing warp is normally a home job, calling either for steaming or redoping of the wing; but a field expedient that can be used is to sprinkle the warped panel with dope thinner and hold it rigidly in a position slightly opposite of the original warp until dry.

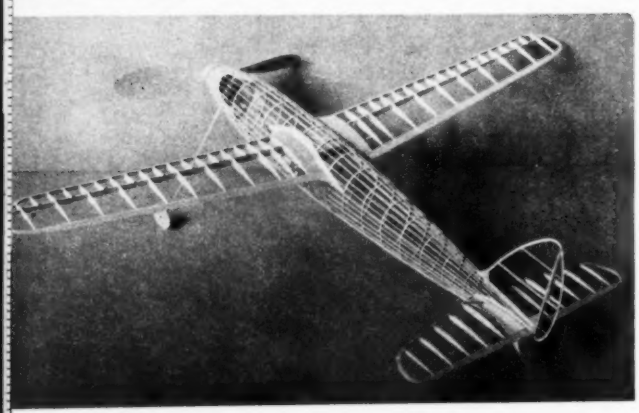
A tendency to turn one way or the other during the ground run will indicate a crooked landing gear, while a turn in the air is an indication of warp or a crooked rudder or tab. At this stage the model should glide only in a straight line. As it becomes evident that all is going well, the power of your shoves can be increased until the model hops to a position about waist high. Any harder shoves will make it zoom, and not having the power on to pull through it will stall and dive into the ground. Work up to the waist-high flight gradually. This height is sufficient for the model to demonstrate its characteristics, and any vicious ones present will not have the things they need, altitude and speed, with which to cause a crackup.

The final stage of power-off testing consists of the overhand glide. For most Class A and B ships one hand supporting it under the center of gravity is all that is necessary as the model can be guided with comparative ease. Larger Class C

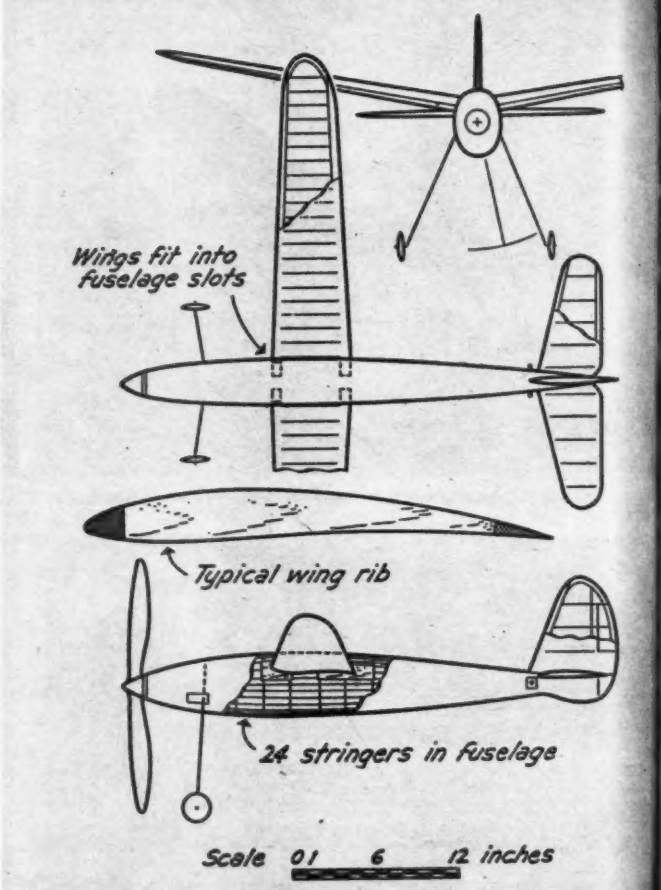
(*Turn to page* 36)

Since the Wakefields will probably be revived in 1948, get up to date on this classic


PROPORTIONS OF THE AVERAGE RUBBER MODEL
SPAN (S)
.65S
.45S
.11S
15% OF WING AREA
35% OF WING AREA
OVERALL LENGTH = .75 OR .8 OF SPAN
WHEEL TREAD = .16 OR .2 OF SPAN
PROPELLER DIAMETER = .4 OF SPAN
DIHEDRAL = .10 OR .12 OF SPAN
.35 S



A typical British Wakefield design, P. T. Capon's beautiful *Krusader*



This "3 view" shows proportions of the British streamliners

Notes on Wakefield Models

by Bill Winter

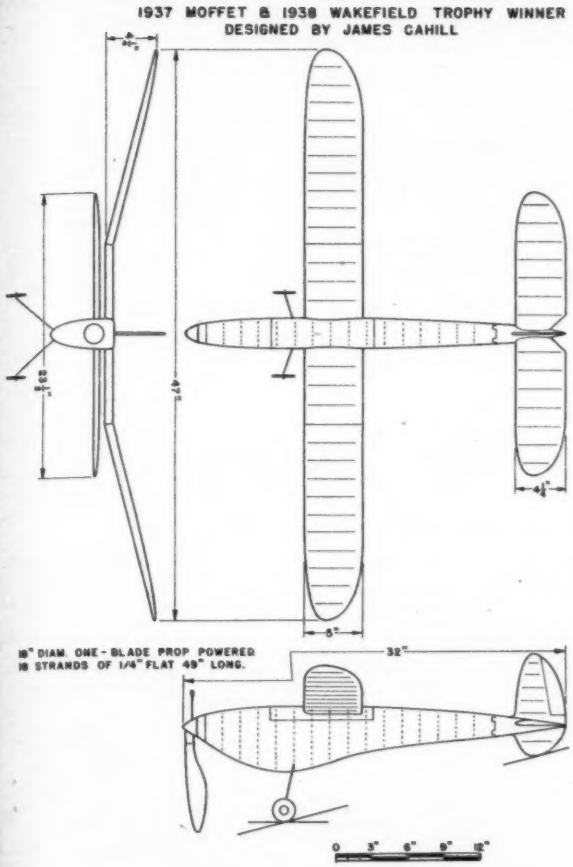
WHEN you think that the *Wakefield* contest has not been held since 1939, it seems remarkable that, despite snarling control liners and gas powered models in general, the world's most famous and most coveted trophy remains the *Wakefield* cup, last won for the United States by Dick Korda.

It was twenty years ago that Newell, of England, won the first round with a time of 52.8 seconds. Since then modelers of many lands, either in person or by proxy, have competed for the renowned trophy that originally was put up by Lord Wakefield to promote friendly competition among the models of all countries. The U. S. holds the narrow edge of one win over Britain who has taken five firsts. Only other winner was France—through Andre Fillon, still one of the world's leading builders—which broke into the winner's circle with a victory in 1937. Two Americans have placed first on two occasions: Ehrhardt in 1930 and 1931; and still-active Gordon S. Light in 1932 and 1935.

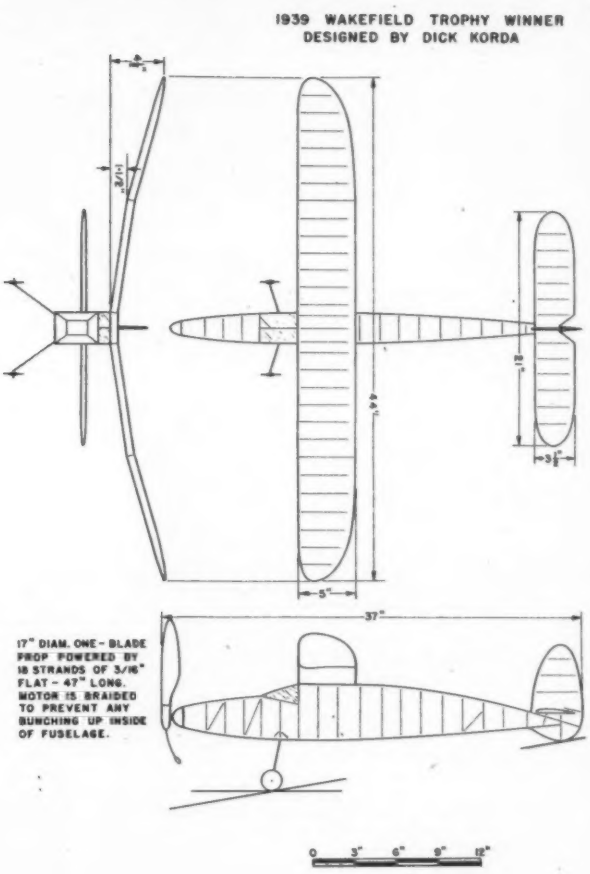
It is expected that 1948 will see the first *Wakefield* contest in nine years. In this country the availability of rubber and the popularity of these events in 1947 indicates that the Wakefields should be held in 1948. Our eliminations would be run off as an event at the Nationals. England, at least, will hold her own massive eliminations and it is to be hoped that another of their fine teams will journey across the Atlantic. South Africa, New Zealand and Australia can be counted on for some fine models, as American proxy fliers of former years will attest. Other nations will add to the international atmosphere of this most colorful of all contests. Since all eyes will be focused on the Wakefields within a matter of months, it is both interesting and worthwhile to review current practice and developments in the design of these specialized models.

The rules, first of all, specify a wing area of 200 sq. in. plus or minus 10, and a crossection of length squared over 100. A unique rule is the specification that horizontal tail area must not exceed 30% of wing area. Attention should be drawn to the fact that these rules are strictly interpreted. The English boys insist on letter perfect compliance with the rules. In the 1939 contest Dick Korda was forced to cut a 1/16 wide strip from the trailing edge of his stabilizer, and to glue several pennies under the fuselage. In 1936 Gordon Light was asked to strip off the covering of his centersection to bring his wing area within British interpretation of the rules. You can count on the rules in the finals being applied down to the last fraction of an oz. and the last sq. in. of wing and tail area.

Those of us who have seen only the American type Wakefield models may not know that, with the exception of Canada, the rest of the world flies models that are singularly different in their performance from our fast-climbing boxes. In this country the ever-present thermals and consistently good flying weather have led to the development of the well-adjusted fast-climbing ship that grabs altitude on the gamble of hooking a thermal. Most of the foreign jobs are designed for long motor runs and efficient flights. We recall how our own experts stood with jaws agape the evening before the last Wakefield, at Bendix, N.J., as the Britishers put in one 5 min. flight after another. (The next day they failed to fly in the early morning when the thermals were about and they were shellacked.) There is small doubt that, in the event of poor weather (by our standards), many foreign models would walk away from


1937 MOFFET & 1938 WAKEFIELD TROPHY WINNER
DESIGNED BY JAMES CAHILL
18" DIAM. ONE-BLADE PROP POWERED
18 STRANDS OF 1/4" FLAT 49" LONG.
32"
0 3" 6" 9" 12"

American designs lean more toward simple rugged construction



This Korda design is just a simple box but it really performs

our best. Given foreign conditions we, too, would go in for longer motor runs and clean designs.

Our conditions make it tough for most foreign machines to beat us on our home grounds. It may be significant that it took Jim Cahill's streamlined planked-fuselage *Clodhopper* to bring back the *Wakefield* trophy from France. Or that Judge's 1936 winner at Detroit, which carried the mug back to Britain, was a box with a stringered nose. Foreign design, because of the emphasis on long duration of power and glide alone, without thermal assistance, has developed a type of ship that differs from ours structurally and in minor details.

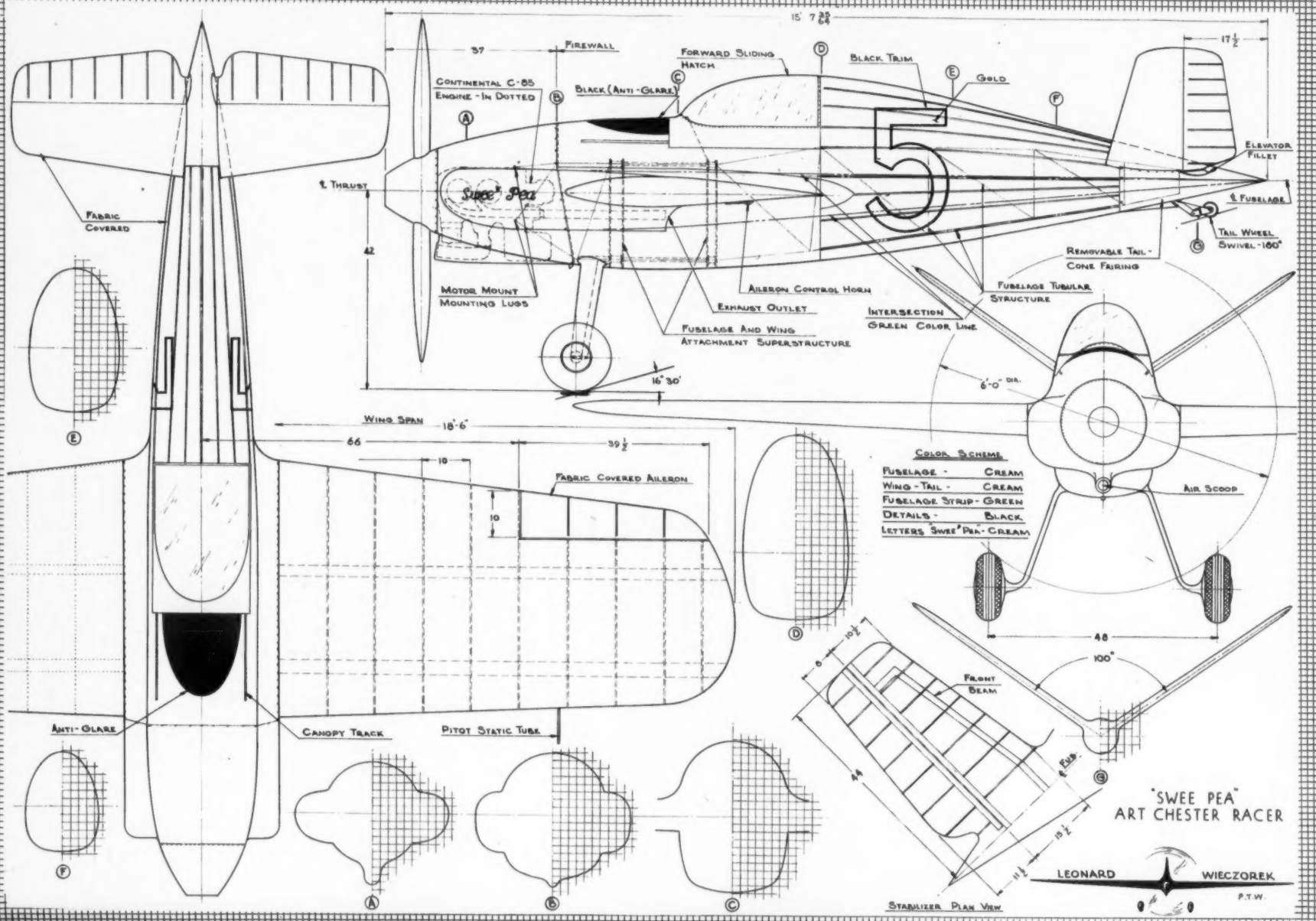
As a rule, the foreign ship is a streamliner, beautifully worked out in detail and involving in some cases twice the time needed in building a Korda-type job. Bob Copland, widely known British builder, has spent many years developing his basic design shown in the drawings. This fuselage is perfectly streamlined with a round crossection throughout. Despite 16 formers and 24 stringers it is very light. Each former is built up by wrapping a 1/16" wide balsa strip several times around a cardboard form; the stringers are only 1/16" square. The tapered wing is built in two panels and has no spars; two heavy edges support the load and provide a precise airfoil section. The butt ends of the edges are extended and so shaped that they fit snugly into sheet balsa sleeves in the fuselage. The fixed undercarriage consists of two streamlined, tapered bamboo landing legs that fit into paper sleeves built into the body. Wheels are streamlined from four-ply balsa. Typical of the careful workmanship is the fact that the axles do not extend through the side of the wheels. A bushing extends half way through the wheel, or through two plies, and a hole is cut through the other two plies to permit installation of the soldered washer. Then the hole is covered with sheet and the outside of the wheel is smoothly finished off.

In passing, American modelers may find interesting the type of dethermalizer that is being successfully used by Copland and other British modelers. In the belly of the fuselage beneath the front spar (leading edge) is a small 1/32" sheet compartment with a spring-loaded trap door. A 10" Japanese silk parachute fits into the compartment. When released it trails behind to slow down the model, steepen its angle of glide and increase the rate of sink. The method of releasing the trap door cover is a fuse made by soaking a piece of white string in a saturated solution of "saltpetre" for half an hour. When dried, the string is cut into convenient lengths for fuses. According to Copland, 1" requires 90 seconds to burn. He protects the fuselage with a piece of mica. To insure the chute opening, Copland found it necessary to put a small 1/2" sq. spacer between the lines where they run together.

Whereas foreign models show flexibility of design ranging from streamliners with tapered wings, and even sweptback wings, mounted in the shoulder position, to various parasols and boxes, American rubber jobs have gradually narrowed down to a strictly utilitarian box with the wing strapped onto the fuselage with external rubberbands. The once popular "diamonds" that were so spectacularly flown by Alvie Dague and Roy Wriston of Tulsa a few years back have lost ground. Since Jim Cahill levelled all opposition with his streamlined *Clodhopper*, and Henry Cole developed his *Smoothie* before the war, no standout streamliner is known to the writer. Even that little touch of realism, the windshield on the cabin designs, is fading into oblivion. In fact, with the nine year interim in *Wakefield* competition it is hard to say what the best design would be. Suppose we run through present design thinking in respect to fuselages, wings, propellers, etc.

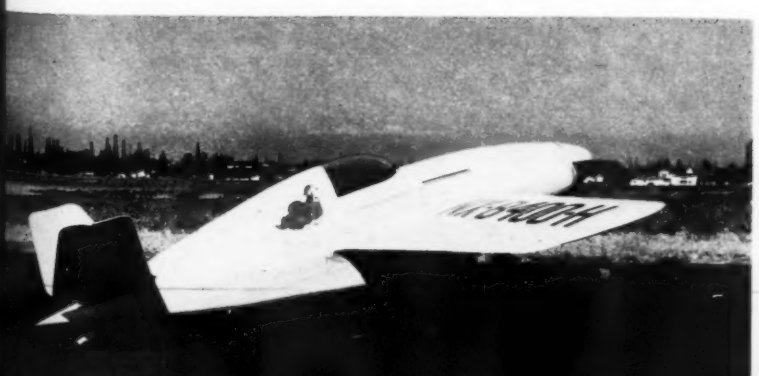
THE FUSELAGE—The most popular practice in this country is a fuselage of rectangular crossection and flat sides of 30-35" length. From 16 to 20 crosspiece stations are required. Longerons are usually 1/8" square, but 5/32" square is sometimes used. The nose section is sheeted in with 1/8" balsa, the corners of the fuselage then being rounded for a clean nose. The rear rubber hook installation is most often a sheet-filled section with small dural plates glued on the sides and drilled for the 3/16" dowel "hook." Diamond-shaped crossections have many good points but make the wing mount a tough problem. Streamliners are few and far between, the average American builder rating them as a waste of time since thermals are easily hooked with any good, properly adjusted model.

(*Turn to page 69*)


15' 7 25/64
37
FIREWALL
FORWARD SLIDING HATCH
BLACK TRIM
GOLD
17½
CONTINENTAL C-85 ENGINE - IN DOTTED
BLACK (ANTI-GLARE)
ELEVATOR FILLET
℄ THRUST
Swee' Pea
℄ FUSELAGE
TAIL WHEEL SWIVEL - 160°
42
REMOVABLE TAIL - CONE FAIRING
MOTOR MOUNT MOUNTING LUGS
AILERON CONTROL HORN
FUSELAGE TUBULAR STRUCTURE
EXHAUST OUTLET
INTERSECTION GREEN COLOR LINE
FUSELAGE AND WING ATTACHMENT SUPERSTRUCTURE
16° 30'
6'-0" DIA.
FABRIC COVERED
WING SPAN 18'-6"
66
39½
10
FABRIC COVERED AILERON
10
COLOR SCHEME
FUSELAGE - CREAM
WING - TAIL - CREAM
FUSELAGE STRIP - GREEN
DETAILS - BLACK
LETTERS SWEE'PEA - CREAM
AIR SCOOP
48
100°
10½
6
FRONT BEAM
44
6 FUS.
15½
11½
ANTI-GLARE
CANOPY TRACK
PITOT STATIC TUBE
STABILIZER PLAN VIEW
"SWEE PEA"
ART CHESTER RACER
LEONARD WIECZOREK
P.T.W.

Swee' Pea

by Robert McLarren



"ALWAYS a bridesmaid but never a bride!" —that's the odd but substantially true sobriquet for Arthur C. Chester, veteran closed course racing pilot. But the fact remains that Chester has won more "place" and "show" money than any other pilot in the racing business. (And if the truth were known, he's probably the all-time race pilot money winner!)

Take the slide rule of the engineer, the smoothly coordinated eye and hand of the pilot, a generous quantity of honest good humor and a big hunk of shyness, wrap them all into a neat, medium-height package topped off by a handsome face and a blond head and you have a rough idea of Art Chester.

If Hollywood were casting him in a picture they'd sign him up for the juvenile lead—he's that boyish looking. But glance quickly back over his career and you'll see that no boy could have been around as long, and few men could have registered the determination and love-of-the-game that Art Chester has in 20 years of flying.

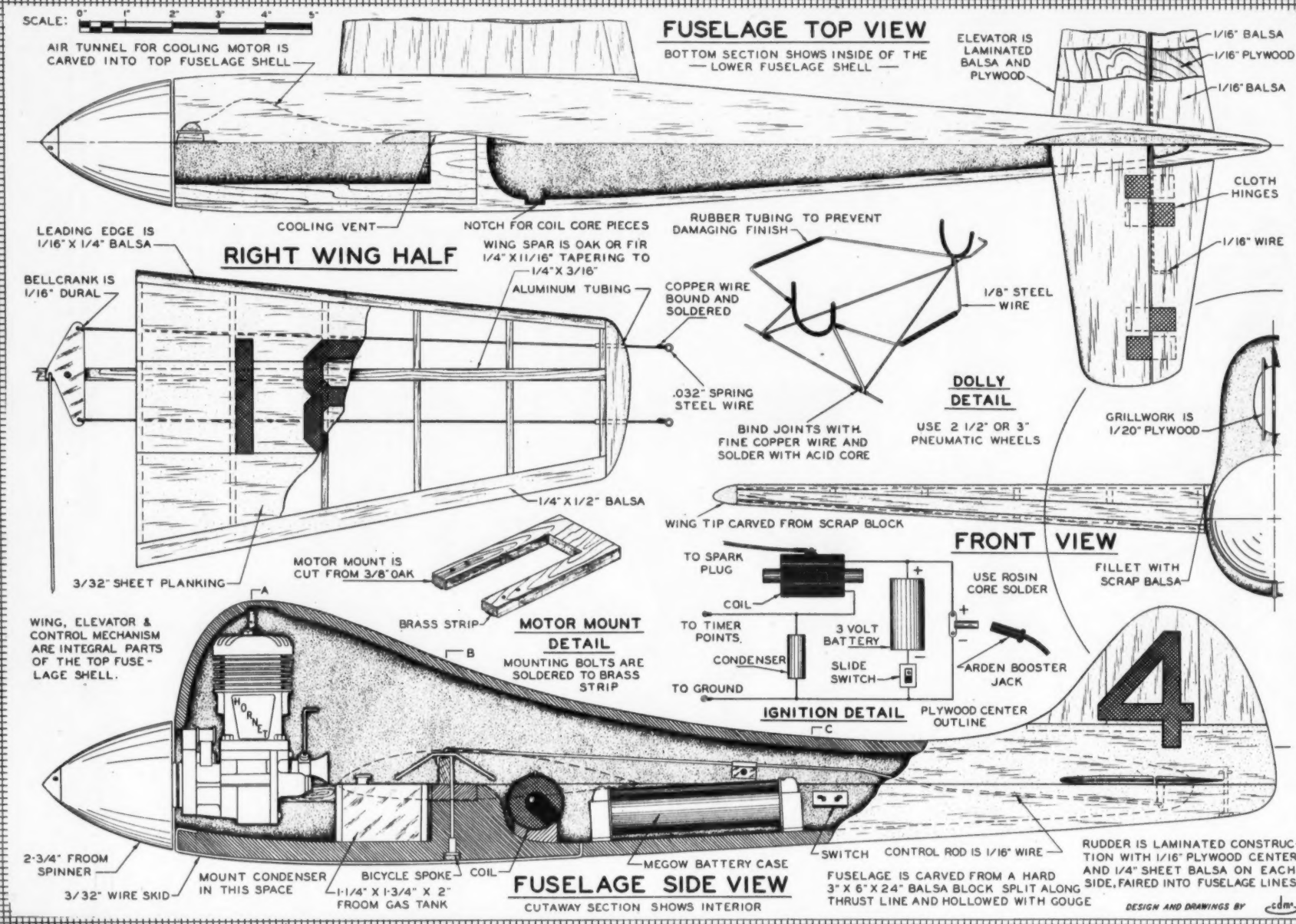
Chester started out, innocently enough, as a student pilot about the time Lindbergh was the toast of the nation. He determined early that flying was to be his "game," and it wasn't long before he was flying into air races and local meets following an all-too-faint scent of cash money.

It was the 1929 National Air Races in Cleveland that first brought him into the money winners circle of air racing and, believe it or not, he hasn't been out of it since! That year he flew a *Travel Air* biplane powered by a Curtiss OX-5, 90 hp engine, to 4th place in his first contest and pocketed $250 for the effort. A high speed triangular race for cut-down speedsters? No! Chester's first earnings in a National Air Race contest was an "added attraction" relay race in which he and Hopkins, Smith and Shelley hopped in and out of the *Travel Air* until nobody was quite sure who was in and who was out, or if the airplane was flying without anybody! But Chester won another $100 in a straight speed race with other OX-5 powered planes, taking another 4th place.

The following year Chester was back at the races, this time in Chicago, with his trusty *Travel Air* biplane. Again he came through, and this time he won two 1st places! Another pylon sizzling closed-course speed event? Nope! He won $100 for placing 1st in a "dead stick" landing contest, and another $50 for 1st place in . . hold on . . a balloon bursting contest! But later in the Races, Chester proved himself one of the coming greats when he settled down to the serious business of pylon flying with his trusty *Travel Air*. He won $500 for 4th place in an open men's OX-5 race, and took 1st place and $375 by averaging 112.29 mph in a 275 cu. in. free-for-all race, forerunner of the present blood-chilling Thompson race.

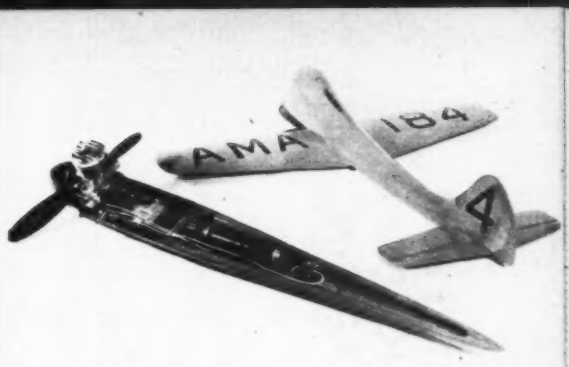
Chester counted the fresh green bills of his Chicago adventure and made a quiet decision: "Air racing can pay off—if you play it right!" But driving a biplane *Travel Air* around a course was not his idea of "playing it right," so he exchanged it for a sleek looking little Davis monoplane powered by a LeBlond air-

(*Turn to page* 62)


SCALE: 0" 1" 2" 3" 4" 5"
FUSELAGE TOP VIEW
BOTTOM SECTION SHOWS INSIDE OF THE — LOWER FUSELAGE SHELL —
AIR TUNNEL FOR COOLING MOTOR IS CARVED INTO TOP FUSELAGE SHELL
ELEVATOR IS LAMINATED BALSA AND PLYWOOD
1/16" BALSA
1/16" PLYWOOD
1/16" BALSA
CLOTH HINGES
1/16" WIRE
COOLING VENT
NOTCH FOR COIL CORE PIECES
LEADING EDGE IS 1/16" X 1/4" BALSA
RIGHT WING HALF
WING SPAR IS OAK OR FIR 1/4" X 11/16" TAPERING TO 1/4" X 3/16"
ALUMINUM TUBING
BELLCRANK IS 1/16" DURAL
COPPER WIRE BOUND AND SOLDERED
.032" SPRING STEEL WIRE
1/4" X 1/2" BALSA
3/32" SHEET PLANKING
RUBBER TUBING TO PREVENT DAMAGING FINISH
1/8" STEEL WIRE
BIND JOINTS WITH FINE COPPER WIRE AND SOLDER WITH ACID CORE
DOLLY DETAIL
USE 2 1/2" OR 3" PNEUMATIC WHEELS
GRILLWORK IS 1/20" PLYWOOD
WING TIP CARVED FROM SCRAP BLOCK
FRONT VIEW
FILLET WITH SCRAP BALSA
MOTOR MOUNT IS CUT FROM 3/8" OAK
BRASS STRIP
MOTOR MOUNT DETAIL
MOUNTING BOLTS ARE SOLDERED TO BRASS STRIP
TO SPARK PLUG
COIL
TO TIMER POINTS
CONDENSER
TO GROUND
3 VOLT BATTERY
SLIDE SWITCH
USE ROSIN CORE SOLDER
ARDEN BOOSTER JACK
IGNITION DETAIL
PLYWOOD CENTER OUTLINE
WING, ELEVATOR & CONTROL MECHANISM ARE INTEGRAL PARTS OF THE TOP FUSELAGE SHELL.
A
B
C
HORNET
4
2-3/4" FROOM SPINNER
3/32" WIRE SKID
MOUNT CONDENSER IN THIS SPACE
BICYCLE SPOKE
1-1/4" X 1-3/4" X 2" FROOM GAS TANK
COIL
MEGOW BATTERY CASE
SWITCH
CONTROL ROD IS 1/16" WIRE
FUSELAGE SIDE VIEW
CUTAWAY SECTION SHOWS INTERIOR
FUSELAGE IS CARVED FROM A HARD 3" X 6" X 24" BALSA BLOCK SPLIT ALONG THRUST LINE AND HOLLOWED WITH GOUGE
RUDDER IS LAMINATED CONSTRUCTION WITH 1/16" PLYWOOD CENTER AND 1/4" SHEET BALSA ON EACH SIDE, FAIRED INTO FUSELAGE LINES.
DESIGN AND DRAWINGS BY edm

Screamer

A slick speed job that will really travel with the right motor and prop



by Claude McCullough

ALTHOUGH the *Screamer* was designed with super-speed as the main consideration, effort was directed toward obtaining a slick appearance for a change from the usual engine-on-a-broomstick "hot rock." This particular nickname isn't completely apt in the *Screamer's* case, for hot it certainly is, but its 2 lb. 9 oz. weight makes it not quite the rock that a speed job usually turns out to be.

The lower than average weight is due partly to the use of balsa wood for the fuselage, and this builder will stick firmly to his guns in declaring balsa to be the best wood for the job. Balsa has the highest strength-to-weight ratio of any wood and with a sufficiently thick fuselage wall is just as resistant to V-bomb landings as bass or other popular hardwoods, with the additional advantage of lower weight. This light wing loading pays off in a snappy breakaway from the dolly and better handling characteristics when whipping the ship down for a landing.

With a stock prop, and gas and oil fuel, 100 mph plus is a certainty. From there into the 130 record breakers, it's strictly dependent on how you stir up your particular witches brew of "soup" and choose the proper pitch and prop diameter. This calls for a brand of seat-of-the-pants flying that only practice and trial and error methods will bring.

The plans may be enlarged by using dividers or "griding" with squares according to the scale indicated. Select a rather hard balsa block 3" x 6" x 24" and trace the fuselage top and side views on it. Sawing it out may be done with a coping saw, but a band saw is more convenient and accurate. The fuselage separates along the thrust line. Roughly finish and hollow the bottom half and install the 3/8" oak motor mount piece. The 1/8" x 1" motor mounting bolts are permanently installed in the mount, and the heads soldered to a brass strip along the bottom. Use plenty of cement and coat all joints several times. When the mount has dried thoroughly, install the motor with tape over the exhaust and intake to prevent chips and sawdust from getting in it. With a wood carving gouge carve out the top part of the fuselage to fit down over the motor. This procedure is particularly necessary if you are using a different engine from a *Hornet*, since the shape of the engine may necessitate slight alterations in the external contours of the top half. When the top half can be fitted down over the motor, dismount it and cement the halves lightly together. Finish carving the fuselage to shape as indicated by the cross section views on the plan. Sand smooth with coarse and fine sandpaper.

The rudder is of laminated construction with 1/4" flat balsa sides and a 1/16" plywood center which is countersunk into the fuselage block. The lines of the rudder and fuselage are faired together in a smooth blending of contours.

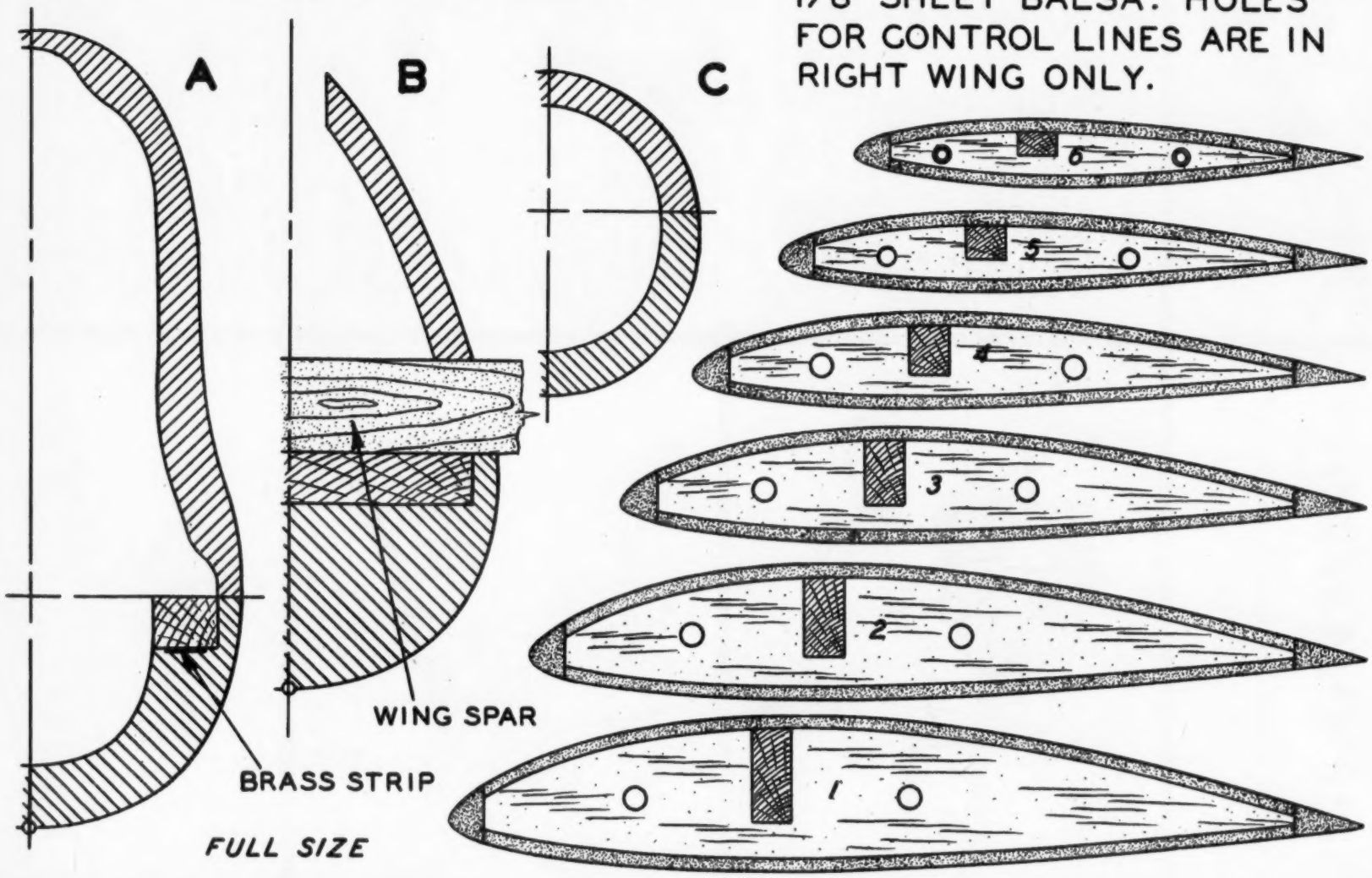
Cut the fuselage apart and complete the interior hollowing. A cooling tunnel for the motor is carved into the top half with 1/20" plywood grillwork being added to the intake vent. All the ignition parts are fastened in the lower fuselage shell.

The wing is constructed around the 1/4" thick hardwood spar. Since the only dihedral used is

(*Turn to page 67*)

PATTERN SHEET

WING RIBS ARE CUT FROM 1/8" SHEET BALSA. HOLES FOR CONTROL LINES ARE IN RIGHT WING ONLY.



Design Forum

by Charles H. Grant

IN the early days of gas model planes it was a real treat to attend a contest. Then the sky was the limit not only in respect to flights and fuel allowance, but also in design. There were usually as many different designs as there were planes. And there was always something new to stimulate your imagination and start you on a new train of thought.

Fliers in those days realized that the dominant force that intrigued them as model builders was *the opportunity for experiment*—discovering something new that might be incorporated to advantage in their next design. As time passed and designs became more or less standardized, the old spirit at contests gradually disappeared. It was much easier to buy a kit designed by some expert, with which he had won a contest. It was easier not to work out original designs and go through the headaches of many crashes and rebuilding operations until the design was perfected.

The advent of control line flying injected a number of new problems, but unlike free flight, these were comparatively simple and not involved, the chief one being speed. This whole lack of thought on the part of present day model builders has caused considerable stagnation in the model game. Many think it is more important to take home a glittering piece of hardware won with some plane he has built from a kit, than it is to witness a successful flight that results from some new wrinkle in design.

Though contests have sponsored events for original designs, surprisingly enough, little interest has been shown in this direction. That is, until comparatively recently when *oldtime model builders* began to drift back from the army to their old hobby. Possibly another reason for the lack of new designs has been the cost in time, effort and cash of crackups. With a new design a model builder is taking a chance which he can ill afford. So, rather than risk the possibility of damage, he has built a model of standard, well tried design; or maybe he has taken up control line flying which eliminates many of the hazards of free flight.

As a result, present model builders are familiar with the characteristics of only a very few free flight types, and many know little or nothing about free flight. Nevertheless, there seems to be a growing curiosity concerning the performance possibilities of unusual types of planes, if we are to judge from the letters we received from readers recently. We only wish we could take some of these fellows out to an oldtime contest—for instance, one way back in 1934. Here they would have a chance to compare the performance of high wings, mid wings, low wings, biplanes, pushers and practically every conceivable type of model. Demonstration of course, is always the best teacher, but there is no such display of design talent at present day contests so we must confine ourselves to advice here in this column.

Henry M. Rowe of Ozone Park, N.Y. is one of those fellows who has just finished a hitch in the army and is returning to his old hobby of model designing and building. Like many of the oldtimers, he writes he is particularly interested in new designs and in "hows and whys of flight rather than just slapping some balsa wood together."

(*Turn to page 57*)

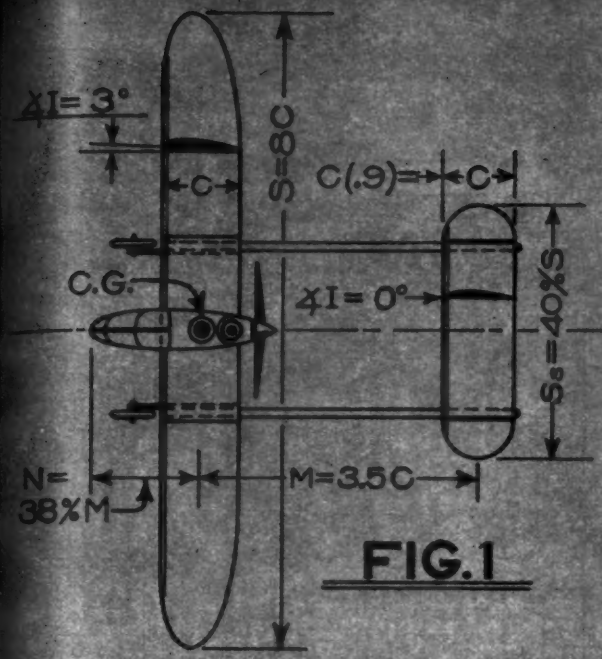


FIG.1

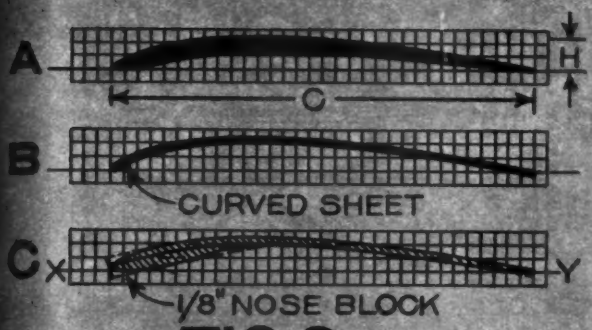


FIG.2

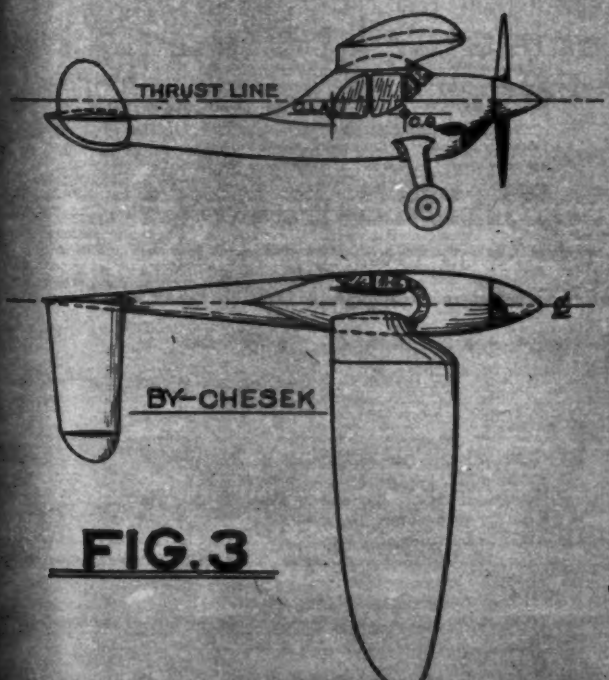


FIG.3

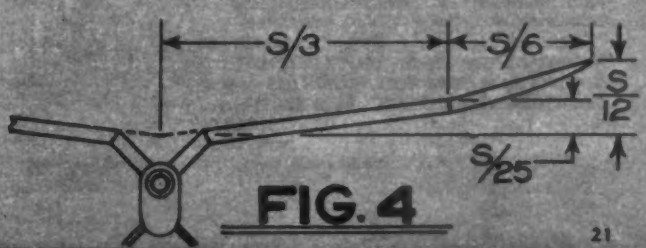
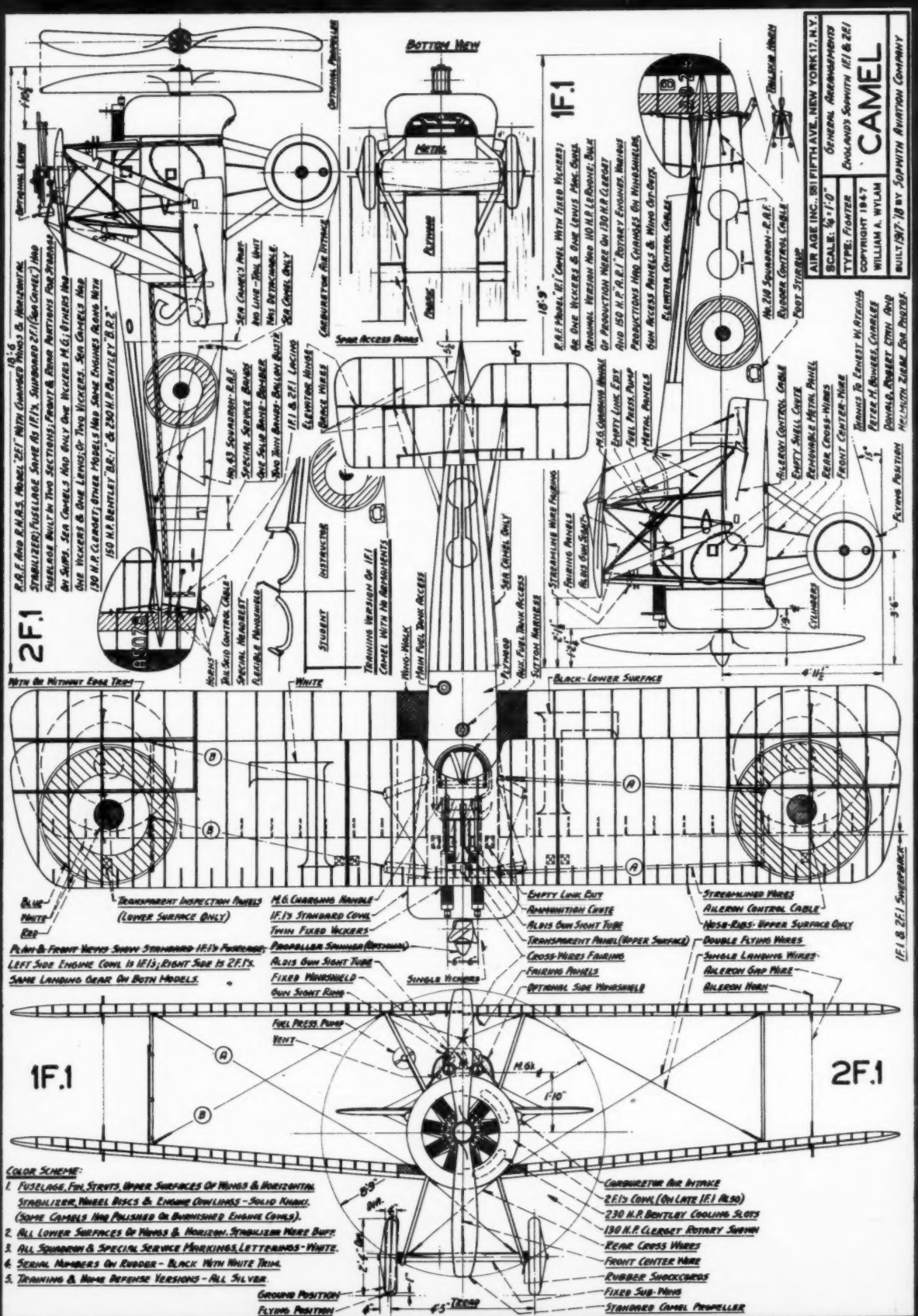


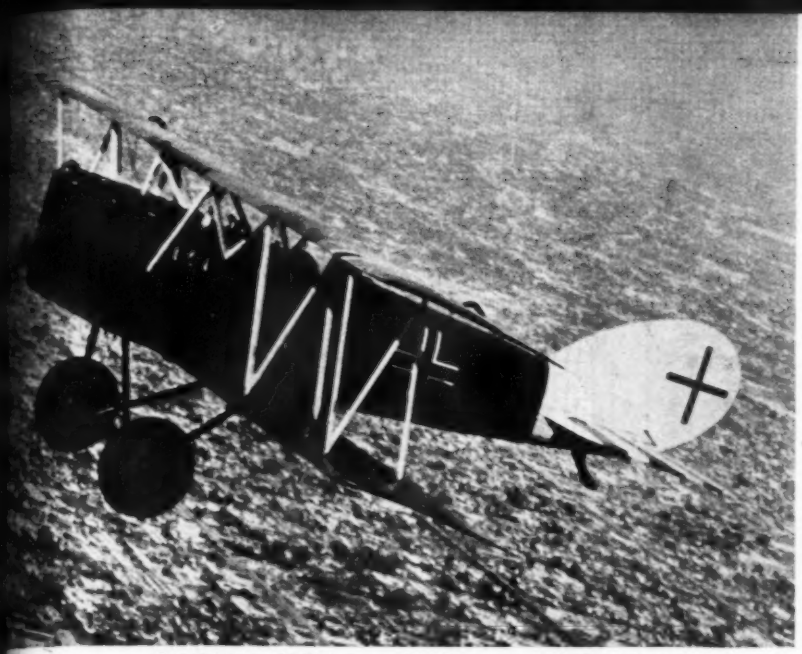
FIG.4

WYLAM MASTERPLAN • WYLAM MASTERPLAN • WYLAM MASTERPLAN • WYLAM MASTERPLAN


CAMEL
AIR AGE INC., 551 FIFTH AVE., NEW YORK 17, N.Y.
SCALE: ¼"-1'-0"
TYPE: FIGHTER
COPYRIGHT 1947 WILLIAM A. WYLAM
GENERAL ARRANGEMENTS
ENGLANDS SOPWITH 1F.1 & 2F.1
BUILT 1917-18 BY SOPWITH AVIATION COMPANY
2F.1
1F.1
BOTTOM VIEW
R.A.F. AND R.N.A.S. MODEL "2F.1" WITH CHANGED WINGS & HORIZONTAL STABILIZER; FUSELAGE SAME AS 1F.1's, SHORTENED 2'-1" (SEA CAMEL) AND FUSELAGE BUILT IN TWO SECTIONS; FRONT & REAR PARTIONS FOR STRENGTH ON SHIPS. SEA CAMELS HAD ONLY ONE VICKERS M.G.; OTHERS HAD ONE VICKERS & ONE LEWIS; OR TWO VICKERS. SEA CAMELS HAD 130 H.P. CLERGET; OTHER MODELS HAD SAME ENGINES ALSO WITH 150 H.P. BENTLEY B.R.1 & 230 H.P. BENTLEY B.R.2.
1F.1 R.A.F. MODEL "1F.1" CAMEL WITH FIXED VICKERS; NO ONE VICKERS & ONE LEWIS MACHINE GUNS. ORIGINAL VERSION HAD 110 H.P. LE RHONE; BUILT OR PRODUCTION WERE ON 130 H.P. CLERGET AND 150 H.P. B.R.1 ROTARY ENGINES. VARIOUS PRODUCTIONS HAD CHANGES ON WINDSHIELDS, GUN ACCESS PANELS & WING CUT-OUTS.
TRAINING VERSION OF 1F.1 CAMEL WITH NO ARMAMENTS
SEA CAMEL ONLY
WITH OR WITHOUT EDGE TRIM
BLACK - LOWER SURFACE
WHITE
BLUE
WHITE
RED
TRANSPARENT INSPECTION PANELS (LOWER SURFACE ONLY)
PLAN & FRONT VIEWS SHOW STANDARD 1F.1's FUSELAGE; LEFT SIDE ENGINE COWL IS 1F.1's; RIGHT SIDE IS 2F.1's. SAME LANDING GEAR ON BOTH MODELS.
M.G. CHARGING HANDLE
1F.1's STANDARD COWL
TWIN FIXED VICKERS
PROPELLER SPINNER (OPTIONAL)
ALDIS GUN SIGHT TUBE
FIXED WINDSHIELD
GUN SIGHT RING
SINGLE VICKERS
FUEL PRESS. PUMP
VENT
EMPTY LINK EJCT
AMMUNITION CHUTE
ALDIS GUN SIGHT TUBE
TRANSPARENT PANEL (UPPER SURFACE)
CROSS-WIRES FAIRING
FAIRING PANELS
OPTIONAL SIDE WINDSHIELD
STREAMLINED WIRES
AILERON CONTROL CABLE
NOSE-RIBS: UPPER SURFACE ONLY
DOUBLE FLYING WIRES
SINGLE LANDING WIRES
AILERON GAP WIRE
AILERON HORN
1F.1 & 2F.1 SUPERSURFACE
M.G.
1'-10"
CARBURETOR AIR INTAKE
2F.1's COWL (ON LATE 1F.1 ALSO)
230 H.P. BENTLEY COOLING SLOTS
130 H.P. CLERGET ROTARY SHOWN
REAR CROSS WIRES
FRONT CENTER WIRE
RUBBER SHOCKCORDS
FIXED SUB-MAIN
STANDARD CAMEL PROPELLER
GROUND POSITION
FLYING POSITION
5'-7" TREAD
COLOR SCHEME:
1. FUSELAGE, FIN, STRUTS, UPPER SURFACES OF WINGS & HORIZONTAL STABILIZER, WHEEL DISCS & ENGINE COWLINGS - SOLID KHAKI. (SOME CAMELS HAD POLISHED OR BURNISHED ENGINE COWLS).
2. ALL LOWER SURFACES OF WINGS & HORIZON. STABILIZER WERE BUFF.
3. ALL SQUADRON & SPECIAL SERVICE MARKINGS, LETTERINGS - WHITE.
4. SERIAL NUMBERS ON RUDDER - BLACK WITH WHITE TRIM.
5. TRAINING & HOME DEFENSE VERSIONS - ALL SILVER.

WYLAM MASTERPLAN • WYLAM MASTERPLAN • WYLAM MASTERPLAN • WYLAM MASTERPLAN

WYLAM MASTERPLAN • WYLAM MASTERPLAN • WYLAM MASTERPLAN •



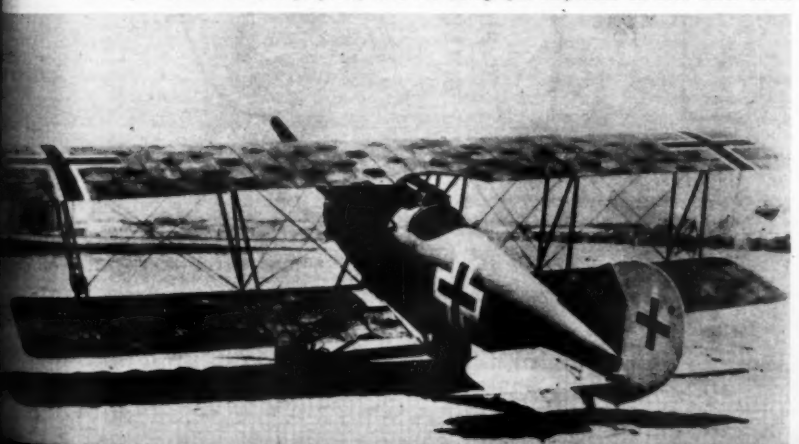
Graceful lines of D.XII are seen in this reconstructed ship flying over Los Angeles

WORLD WAR I

by ROBERT C. HARE

Details of nose and cowling are seen in this picture of the D.XII taken at the war front

This ship was used for test purposes; note the barographs suspended on both outer struts



LAST month these pages presented a background of information on the Pfalz D.XII pursuit plane, which was thrown into battle by the Germans late in 1918, and carried the beginning of a detailed structural analysis.

The airplane, it will be remembered, was briefly a peculiar combination of up-to-date aeronautical design (for 1918) combined with staid conservatism as far as wing structure was concerned. The result, oddly enough, was an airplane possessing first class performance but hardly instilling confidence in those pilots who were not familiar with its good qualities.

Control and Stabilizing Surfaces

High aspect ratio ailerons were fitted only in the upper wing. Their spans were 7 ft. 9 in. each, including the balanced portion, and chord varied from 10 in. at inboard tip to 11-3/4 in. at the overhang tip, measuring from the hinge line. A balanced overhang portion of .8 sq. ft. extended forward of the hinge line an additional 11-3/4 in., providing a total area for both ailerons of 18.4 sq. ft.

They were constructed entirely of light steel tubing components welded together, then covered with fabric. Hinges consisted of steel eye-bolts attached alternately to the aileron spar on the wing and to the aileron steel tube leading edge, and through which was passed a 3/16 in. diameter low-carbon steel rod. The rod was held in place at one end by a cotter pin and on the outboard end by a threaded knob.

A structural simplification — for maintenance as well as for manufacturing reasons —was a departure by the D.XII's designers from the integral, fixed vertical fin of the Pfalz D.III to a more conventional surface. The fin was a simple welded steel tubing unit covered with fabric and bolted to the fuselage. The horizontal stabilizer, on the other hand, was built integrally with the fuselage. Its two spars ran completely through the fuselage and carried plywood ribs punched out with numerous lightening holes. It was covered with a three-ply wood skin which ended abruptly at the fuselage and was not part of the latter's skin. Because of the method of construction, it was impossible to adjust the stabilizer's angle of incidence (it was set at 0 deg.), and it was removable only by cutting through the spars. The tail plane was a cantilever structure with a deep symmetrical airfoil.

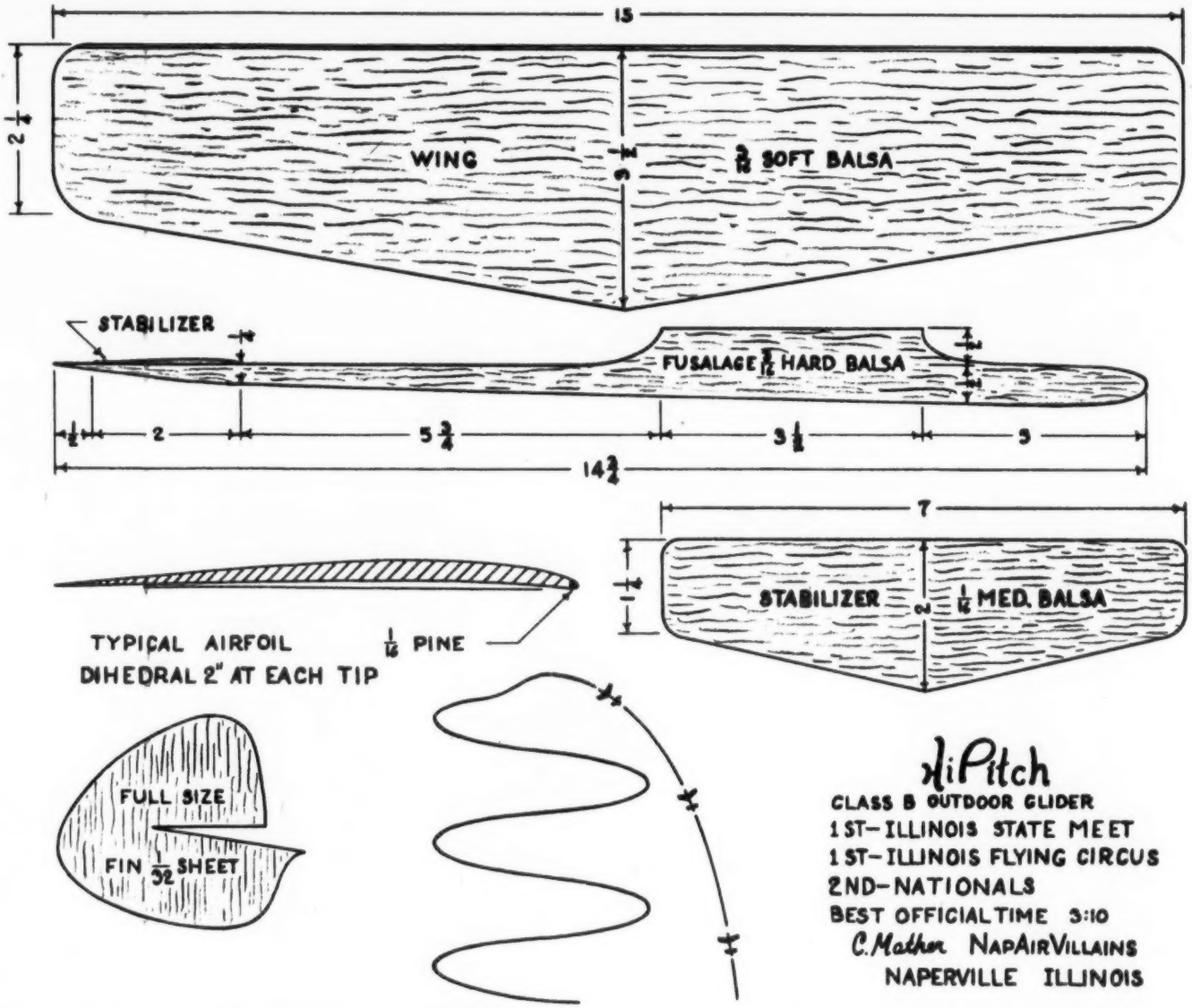
D.XII elevators were balanced and divided along the trailing edge to permit rudder movement. Construction was entirely of steel tubing assembled by gas welding. Elevator leading edge was a steel tube flattened to a vertical oval along the stabilizer and to a horizontal oval in the balanced portion. Hinges were identical to those on the ailerons. Covering was camouflaged pattern fabric. The balanced rudder was of identical construction.

Rigging

Because of its numerous wires and struts, assembly and rigging maintenance on the Pfalz D.XII was quite extensive. All interplane struts were made of streamlined steel tubing. The one piece upper wing was supported from the fuselage by a pair of "M" shaped struts, upper points of which connected to fittings on the spars. Their lower extremities were attached to fittings mounted on the third, fourth and fifth fuselage bulkheads at points where the longerons connected. The upper wing had no dihedral, but was set at 3-3/4° positive incidence. The angle was variable through about 1° by means of adjusting nuts in the fittings.

Lower wing was attached to the plywood fillets already mentioned, and also set at 3-3/4° incidence. This angle was not adjustable. Attachment was accomplished by

(*Turn to page* 39)



HiPitch

CLASS B OUTDOOR GLIDER
1ST–ILLINOIS STATE MEET
1ST–ILLINOIS FLYING CIRCUS
2ND–NATIONALS
BEST OFFICIAL TIME 3:10

C. Mather NapAirVillains
NAPERVILLE ILLINOIS

Hi Pitch

by C. Mather

GLIDERS return a lot of pleasure from a small investment of material and effort. Much fun and nice flights are easily obtained, but excellent performance demands as much skill as any phase of modeling.

Not long ago we watched Milt Huguelet, Bob De Batty and one or two others putting their gliders right next to the ceiling of a Chicago armory. That is a long way up, and Huguelet has bettered a minute, which is a long time for a glider to float around indoors. Outdoors we have seen friend Bob Lawrence of Rockford uncoil from a Dizzy Dean wind up and put his gliders up better than 100 ft. Performances like those are rarely enjoyed, but they do show what can be done.

Hi Pitch evolved from a series of outdoor glides built during the last two years. Gliders are not troubled with torque, but they do have terrific speed when launched hard. The generous dihedral and wing mount seemed to give this model much inherent stability that makes adjusting easier. The surface outlines were adopted after elliptical shapes failed to improve performance.

Little need be said about construction. Outdoor gliders fly away regularly so we don't recommend spending a lot of time producing a perfect model. The most important thing is to align the surfaces accurately. The wing is "square" with the fuselage stick (top projection) and is set at zero degrees (parallel) with the stabilizer. The pine leading edge will protect the wing from minor collisions. A gauze or silk strip glued over the wing-fuselage joint will add welcome strength. Tissue doped over all parts will add color, strength and will smooth over the porous balsa. Straight dope is likely to be brittle and warp the thin surfaces, so add a small teaspoon of castor oil to one-half pint of thin clear dope. Better yet, apply the tissue with commercial glider polish. The plans are half size except for the fin.

Unfortunately we have not discovered a simple set of instructions that can be depended upon to produce good flights. Each design, even each glider, has peculiarities that can cause its destruction or its success. We can however present many of the adjustments used and perhaps they will enable you to develop a technique or improve upon the one you have.

A sizable hunk of clay will have to be modeled on the nose to balance the glider. Grip the glider as a dart under the wing and launch, nose down slightly, with just enough speed to keep it flying. Add or remove clay until a long smooth glide is obtained. Next observe the wing for warps. If either panel has more incidence than the other bend the fin slightly to produce a gentle turn in that direction. For instance, if the trailing edge of the left panel is warped down a bit, attempt a left gliding circle. Go easy on all adjustments. Gliders are small and have lots of speed when thrown hard, so adjustments are critical. If the wing is not warped, adjust for a left circle. Thermal currents often spiral and in the northern hemisphere their direction will be clockwise or a "right" circle. If a glider circles to the right a thermal will tend to tighten the turn. As this can spiral a glider down sharply, possibly spoiling a good flight, we use a left circle where possible. A right gliding circle is O.K. if care is taken to keep it large enough.

Once the glider has a long smooth path with a gentle turning tendency, put a little pep into the launches, about enough to get the model up 20 ft. or so. Release the glider upwards, about 45°, and bank slightly with the turn. Don't "lean on" the model because more adjusting is probably needed. The glider should zoom up straight ahead, then as it slows, turn slightly and level off.

There are two unsatisfactory flight patterns that often show up here. First, let's take the glider that zooms up and stalls instead of recovering smoothly. On succeeding launches increase the bank. If the stall persists, tighten the gliding circle by adjusting the fin. Usually, increasing the launching bank will remedy the stall.

The other problem is a glider that steepens its bank dangerously when launched. Try launches with less bank, or even bank the opposite way from its gliding circle. If this tendency persists, bend down the trailing edge of the inside wing. Most gliders need a little of this adjustment. This wing adjustment often induces a circling tendency of its own and it may be necessary to remove some of the fin adjustment. Sometimes it will be necessary to bend the fin more. Warping the wing, as described, increases the lift of the inside panel which in itself tends to bank the glider away from the circle. However, increasing the lift also increases the drag and whichever is the stronger will show up in tests and suggest adjustments.

In general we like to use as little adjustment as possible to keep overall drag down, and large warps rarely bring results; skill in releasing the glider at the correct angle is a major factor for successful flights.

As the glider responds satisfactorily, begin increasing the power behind each launch. As the speed increases so does the difficulty in producing a smooth flight. Sometimes changing the direction of the circle will produce results, for even a slight slewing of a glider's wing, caused during construction, will make it imperative to circle one certain way.

We have not had much results from stabilizer adjustments. If a glider dives, when speed is increased, probably the stabilizer has positive incidence. This may be removed by bending the trailing edge up, but it is better to remove the stabilizer and work the fuselage down. Very slight stabilizer adjustments seem to work, but an upturned trailing edge usually produces a zoom just when the glider should level off, and a down warp usually produces a dive.

As with other models, close observance of the flight path and careful adjusting is a golden rule for gliders. Many modelers stick to this dart style of launching with good results. We have found that when *Hi Pitch* is adjusted as described we can get more altitude by hooking a finger over the trailing edge, and launching it as if it were a baseball being thrown in from the outfield. The glider zooms up in a couple of chandelles, and by varying the oomph behind each launch it can be made to recover at the best position. It is necessary to strengthen the trailing edge for this launch; an inch square piece of hard 1/32 sheet laid grain chordwise will do.

The glider pictured has done 45-50 seconds in evening air, and 4 were lost last season. A farmer found one 25 miles from its launching site.

Air Ways

News of model airplane experimenters all over the world

CANADIAN MODEL NEWS. The Royal Canadian Flying Clubs Association have informed us that they are interested in receiving from all Canadian model clubs—and from as many Canadian individual modelers as possible—expressions of opinion relative to the formation of a model aircraft association of truly national character. The R.C.F.C.A. is the Canadian representative of the Federation Aeronautique Internationale, and if the projected model association can be brought about it is proposed to delegate to it all F.A.I. authority in matters pertaining to model aeronautics.

It is felt that Canadian modelers would benefit greatly from the new group: through assistance in obtaining flying sites, both summer and winter; possible provision of meeting and workroom space; and the setting up of uniform rules.

Many agree that model activity in Canada has sadly lacked coordination, therefore an association as visualized will certainly be a big step forward in this direction. Before anything concrete can be undertaken, however, the sentiment of Canadian modelers must be made known and we urge all persons interested to get in touch with the R.C.F.C.A. at 309 Journal Building, Ottawa, giving name and address of their model association and the corresponding secretary.

STOPWATCHES FOR ALL. In these columns last October we noted that war surplus stopwatches are now reaching the market in such quantities and at such prices that they will soon be within the reach of most individuals, and certainly of all clubs that desire to purchase them. After testing quite a few time pieces we can offer the following notes for those who expect to purchase one of these necessary tools of model flying.

We have seen only two different makes, Elgin and Waltham, both made with identical dials; the large hand makes one revolution in ten seconds, and each second is split into ten marked divisions; the small hand revolves once in five minutes. The Elgin watches we tested were all used, and as with most used surplus some of them were pretty well "beat up," although in most cases this was not apparent from the outward appearance which was uniformly quite good. These 15 jewel units are housed in a case that appears to be of nickel-silver, or some such alloy which has a warm color similar to white gold. The only Waltham watches we were able to obtain were new and unused. They have 9 jewel movements, are housed in chrome plated cases, and have exactly the same dial as the Elgins.

These Walthams seem to be uniformly reliable; ours is going strong after much use and it has never failed us. The same cannot be said for the used Elgins, however, and we suggest that all buyers of this type insist on a money back guarantee before purchase. In fairness to the sellers, we must say that they buy the goods from the Government in good faith, and supposedly after each unit has been carefully checked. However, in one case we had to return two of these watches which had various defects before getting a good one (in both cases the box had markings that stated the watch had been Government-checked and found perfect).

When you purchase one of these watches (or any stopwatch for that matter) try it out as follows: after winding, start it 100 times to be certain it will go every time, and that the hand begins movement only after the button is fully down and doesn't jump sharply from zero before beginning its smooth movement around the dial; let the watch run for an hour or so a dozen times to make certain it won't stop when you are timing a record breaking flight, winding it up before each run; lastly, check the watch over a period of an hour or more against an electric clock for time keeping accuracy.

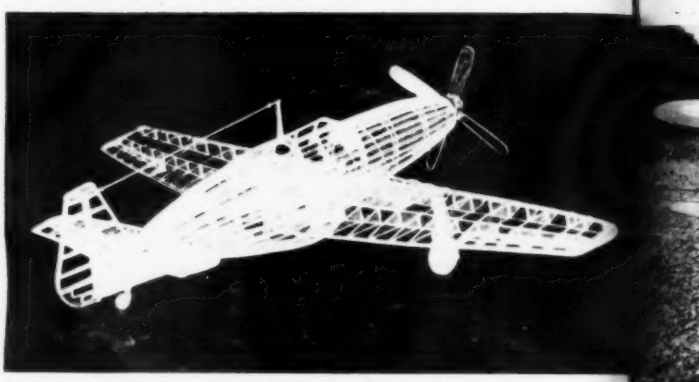
We have had watches that failed such tests, which naturally made them useless for model use, or any other use for that matter. If the watch passes the other tests but is off a few seconds in an hour in the time check, you can adjust it the same as any other watch. If it is off more than this, reject it because it more than likely will need major repairs, or at least a good cleaning.

To sum up: these watches are a real value, and if you know what to guard against you can't go wrong at the price asked.

ENGINES OR MOTORS. The matter of what to call the powerplants of our model planes, while it affects their performance in no way whatever, is one that has caused quite a few minor controversies. Aside from calling them everything we can think of when they refuse to start, the problem boils down simply to which is the proper term—engine or motor.

W. A. Godlewski writes us: "Ever since model aviation adopted

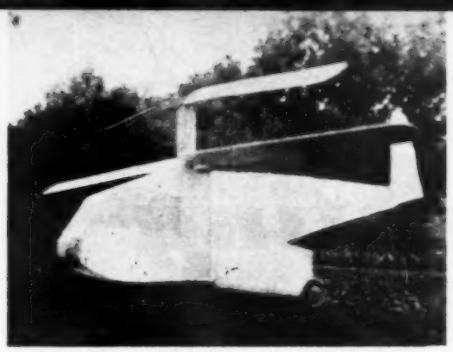
No. 1 Talented Myrtle Robbers' Class C rubber powered model



No. 2 Scale P-51B made of plexiglas by Sgt. Thomas Kirley

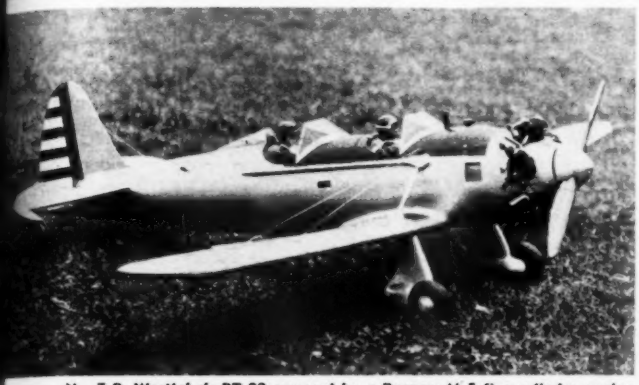
No. 3 Rene de Guire's Supermarine E 10/44 powered by a *Dyna-Jet*

No. 4 CO-2 free flight model by Fred M. Taylor



No. 5 Successful helicopter by Tom Bohman

No. 6 Donald J. Hollister's Yogi pusher

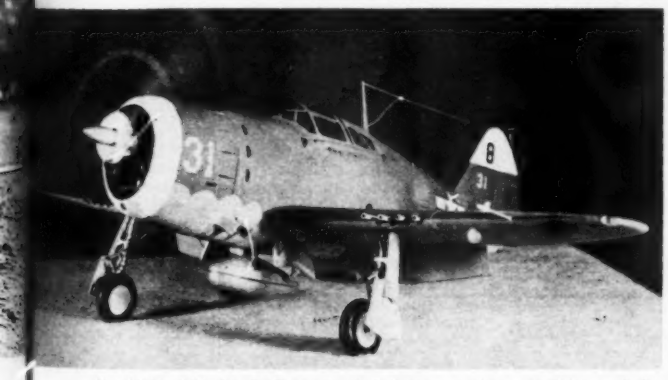


No. 7 R. Westlake's PT-22 powered by a Burgess M-5 five cylinder engine

No. 8 Free flight ship designed and built by De Remington has *Elf Single*

No. 9 A. C. Olsen's control line biplane is built from many ships

No. 10 *Demon* designed by Y. Van Hattum and built by T. Mast in Holland



No. 11 Paul Nock's P-47 constructed during war has everything workable

No. 12 Successful seaplane by P. Sandford has automatic elevators

Mr. Brown's innovation the 'big fellows' of those days uttered phrases that still ring in my ears: 'I bought a new "motor" today, and wait until you see it!' Yes, they bought something that they called a 'motor,' but I imagined it as something like in the Erector Set. But how in the name of aviation are they going to get an electrical cord long enough to plug into a socket and get a flight as long as my rubbered powered models?

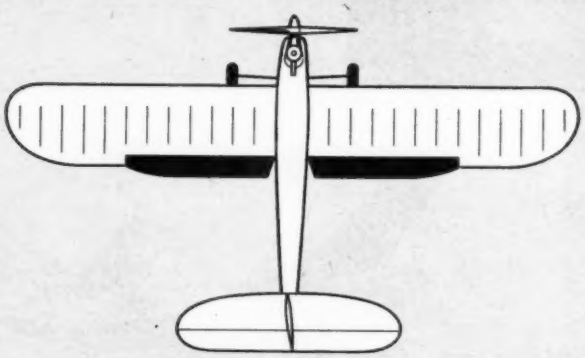
"Well, that was what I imagined their 'motors' to be like. Of course they were quite different than what I expected, and my first question was: 'Is that a motor?' 'Yes,' they all chorused."

He goes on to say that it wasn't until he entered Naval Air Service school that the true meaning of the two words was made clear to him. Thus he found that an engine is a machine by which physical power is applied to produce a physical effect, or for converting heat energy into mechanical energy. A motor, on the other hand, is a rotating machine which transforms electrical energy into mechanical energy. Using these definitions we see that our powerplants can be nothing else but engines.

A little browsing in various dictionaries, however, soon had us completely confused again. Our Webster agreed substantially with the above on "engine." But a "motor" is defined as:

(*Turn to page* 47)

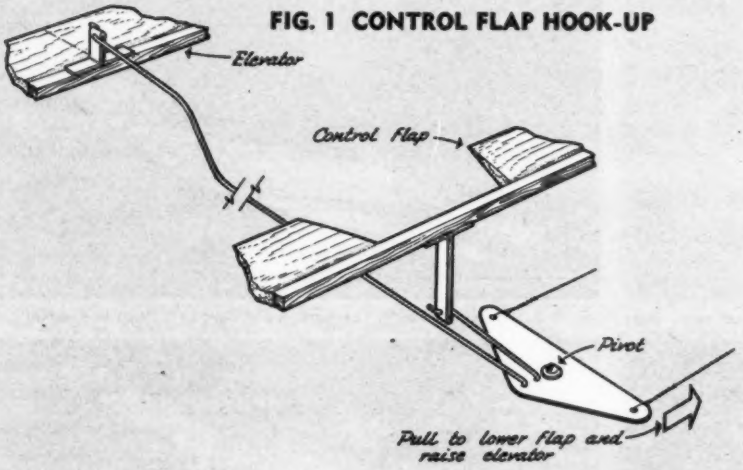
ADD FLAPS For Stunting



by H. A. Thomas

Here is an experimental scheme that has shown great promise—it's worth trying

FIG. 1 CONTROL FLAP HOOK-UP



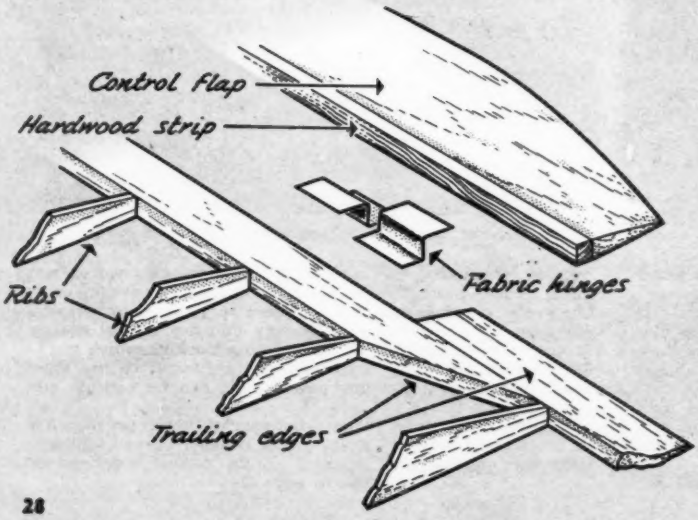


FIG. 2 INSTALLATION OF FLAPS

FEW modelers can resist the urge to build a real stunt model after having seen a good one flown at the hands of a capable model pilot. It appears so simple yet anyone who has mastered the art will tell you that real success depends on a reliable engine which produces steady power at all flight attitudes, a pilot who has developed the technique of handling the model smoothly in both upright and inverted positions, and a well designed model of correct size and proportions.

Many engines on the market today, when equipped with one of the several types of inverted tanks and fitted with a fairly low pitch propeller of considerable blade area, are well suited to stunt flying. Flying ability is largely a matter of practice and perseverance, though some individuals display an unusual aptitude for it. The third item—the model itself—shares equal importance with the others. And of the many factors involved in it, the control system warrants particular attention. Often the short length of the model, the large angular movements of the elevators, and the streamline wing section set at zero incidence combine to make the plane tricky and prone to stall out or mush badly when called upon to turn in a short radius. In an effort to improve this condition we combine flaps with the elevators on the same bellcrank and rig them to move in opposite direction to the elevators.

Stated another way, the basic idea of adding flaps to the control system is to improve the wing section when the model dives or climbs. The flaps, incidentally, are not to be confused with drag-type landing flaps, these are control flaps of generous area and very slight movement, meant to add lift at a minimum of drag.

For most effectiveness the flaps should be near the center of gravity, because as their position is moved rearward the action tends to reverse. This suggests a low aspect ratio flap, set into the wing trailing edge. As a compromise in consideration of the strength requirement of the wing near the center, the flap might be only partly inset and might flare beyond the normal trailing edge a bit. Movement must be *slight*, not over one-third that of the elevator. This is easily accomplished by making a separate hole in the bellcrank, nearer the pivot, for the flap pushrod, and also by lengthening the flap control horn. To make the elevator and flap move in opposite directions the horn on one is mounted above, the other below the surface. Some planning is required in the plane's design to build in the flaps and the added control system in the neatest manner, but by utilizing external wire and horn you can convert existing models to this system for experiments.

Pointers to bear in mind are these: make bearings and hinges carefully and watch alignment to minimize friction in the entire control system; drill several holes in the bellcrank to try various ratios of movement between the flaps and elevators; check to see that the flaps and elevators are both zero when the handle is held in neutral.

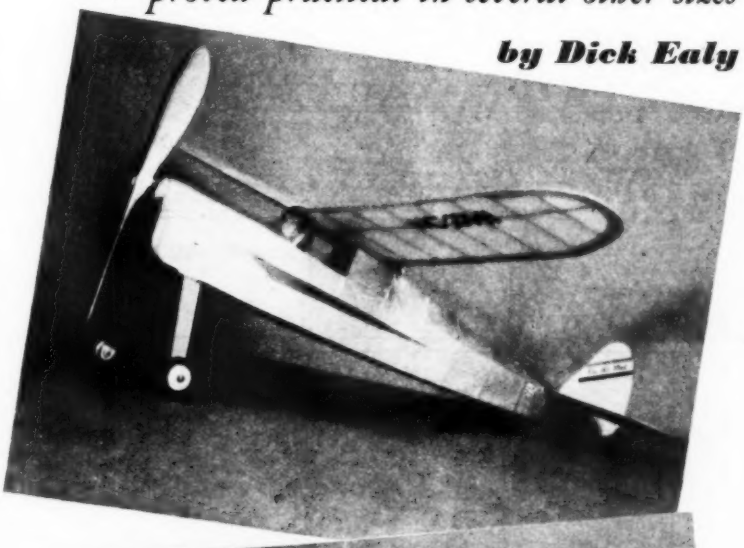
If you use this system in a new model, or add it to one you already have on hand, we suggest you test the value of the idea by disconnecting the flap pushrod temporarily, taping them in neutral position and flying the model by flipper control only.

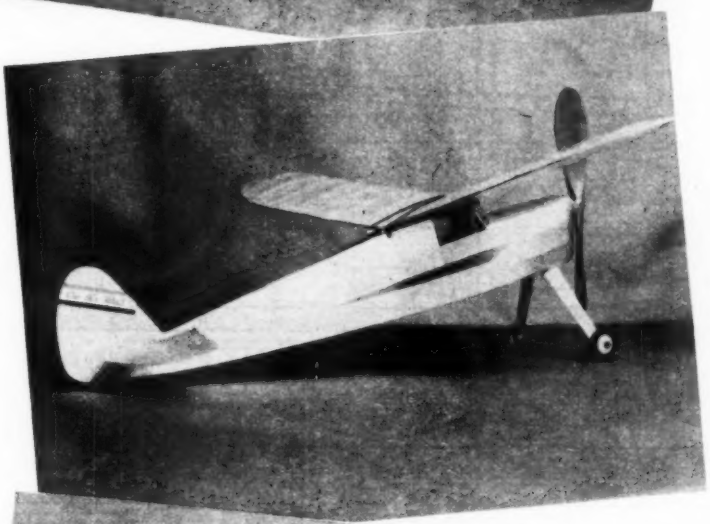
Models equipped and flown with this system of control have been most promising in flight. They would appear to change direction without the slightest mushing which is frequently noticed in conventional models. The full potentialities of the idea are still unknown, however, and we would appreciate hearing from readers who might have experiments of interest to report along this line.

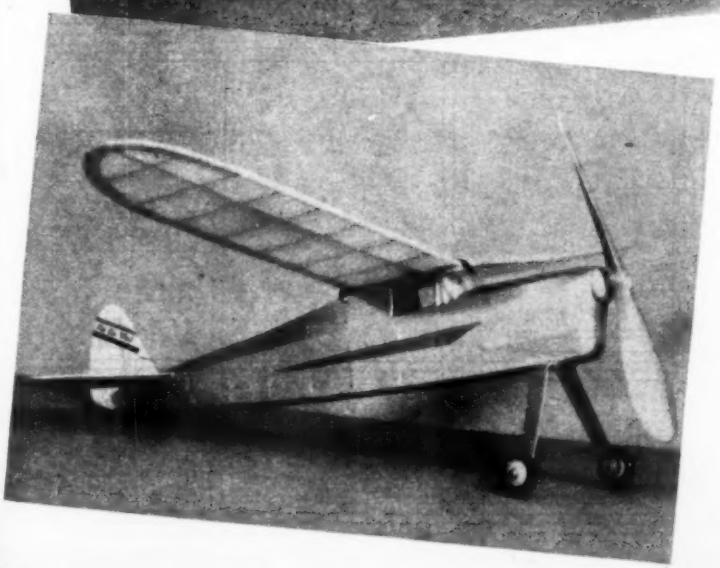
De Luxe Jr.

Simple rubber model of a design that proved practical in several other sizes

by Dick Ealy







THIS model is presented for beginners who like to build rubber models. However, it can easily be scaled up to two or three times its size by those who want to build Class A and B gas models. The design is a basic one that has proven itself over many years of flying as a fine all around design. Another version along the same lines was the author's *De Luxe*, a Class C gas job, in the November 1945 issue of M.A.N.

Read instructions carefully before starting construction. Make both fuselage sides first from 1/32" sq. medium balsa. When glue is dry, rest fuselage on top longerons and put crosspieces in at stations A and C. These are same width. Prop sides up and use triangle to square sides with bench. Wait for glue to dry; then taper longerons at rear inside to match when pulled together. Cement the rear, and after it is dry add 3/32" crosspieces cut to fit, from C to G. Make noseblock from medium balsa 5/8" x 1 1/8" x 1 7/8". Drill 3/8" dia. hole for nose plug. Notch block to receive longerons and cement block in place. Add front crosspieces in fuselage.

The top or cabin is made next. Cut bulkheads A through G out of 1/16" sheet balsa and cement in place. Make the cabin top in streamline form out of 1/16" sheet balsa. Cut a notch about half way through on underside, just back of bulkhead C. Crack or bend the wood down and place on top of bulkheads A through E. Cement the top in place and add a 3/32" sq. stringer from E to rear, to finish cabin.

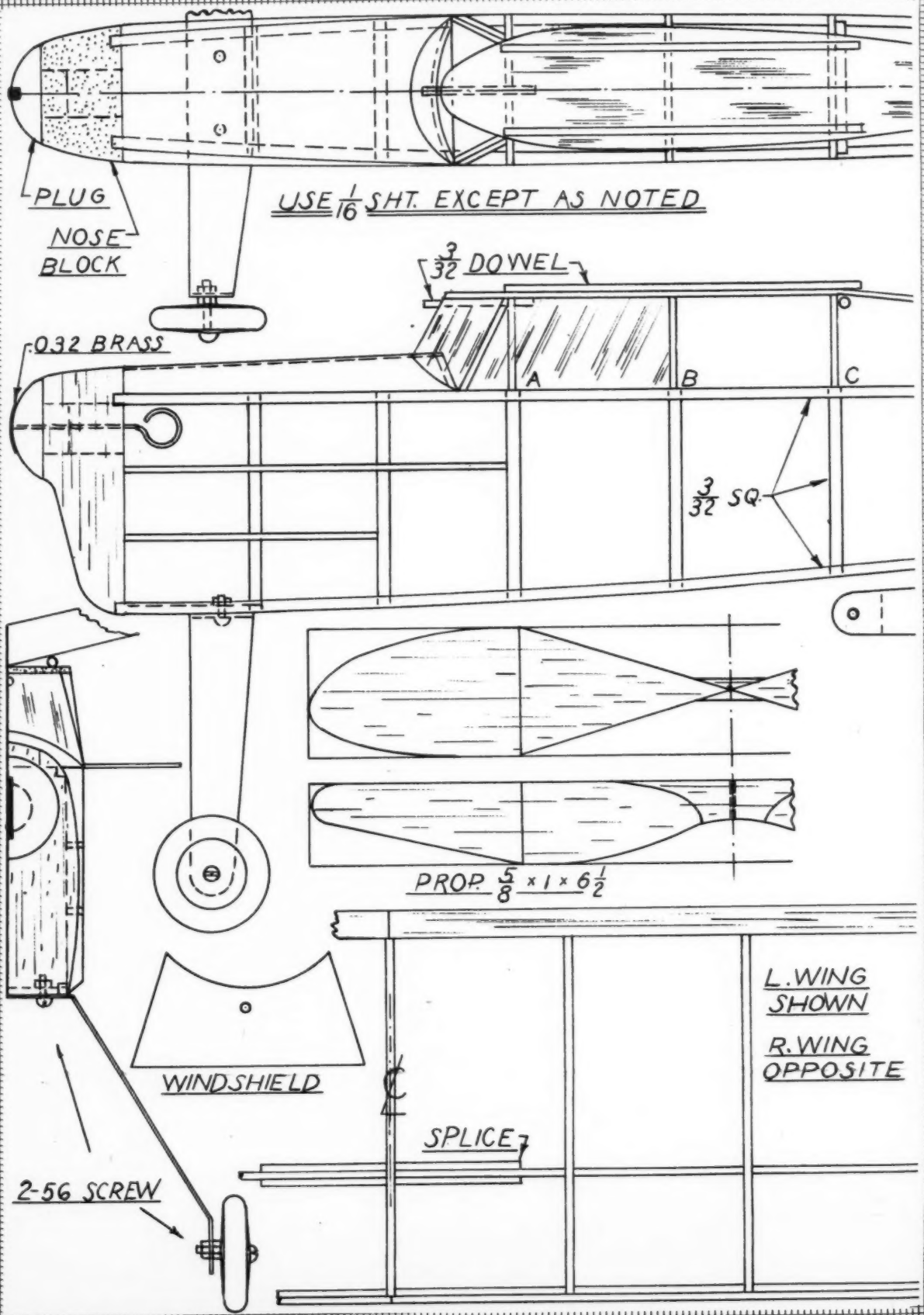
Make tail and rudder from soft 1/16" sheet. The grain is indicated by arrows. This type of construction prevents warping. The rudder is made in one unit like the tail and is cemented on the tail first—then add tail and rudder assembly to fuselage. Set it flat on top longeron. Tail skid is small steel wire. A small filler block is used to fair the cabin top where rudder joins tail.

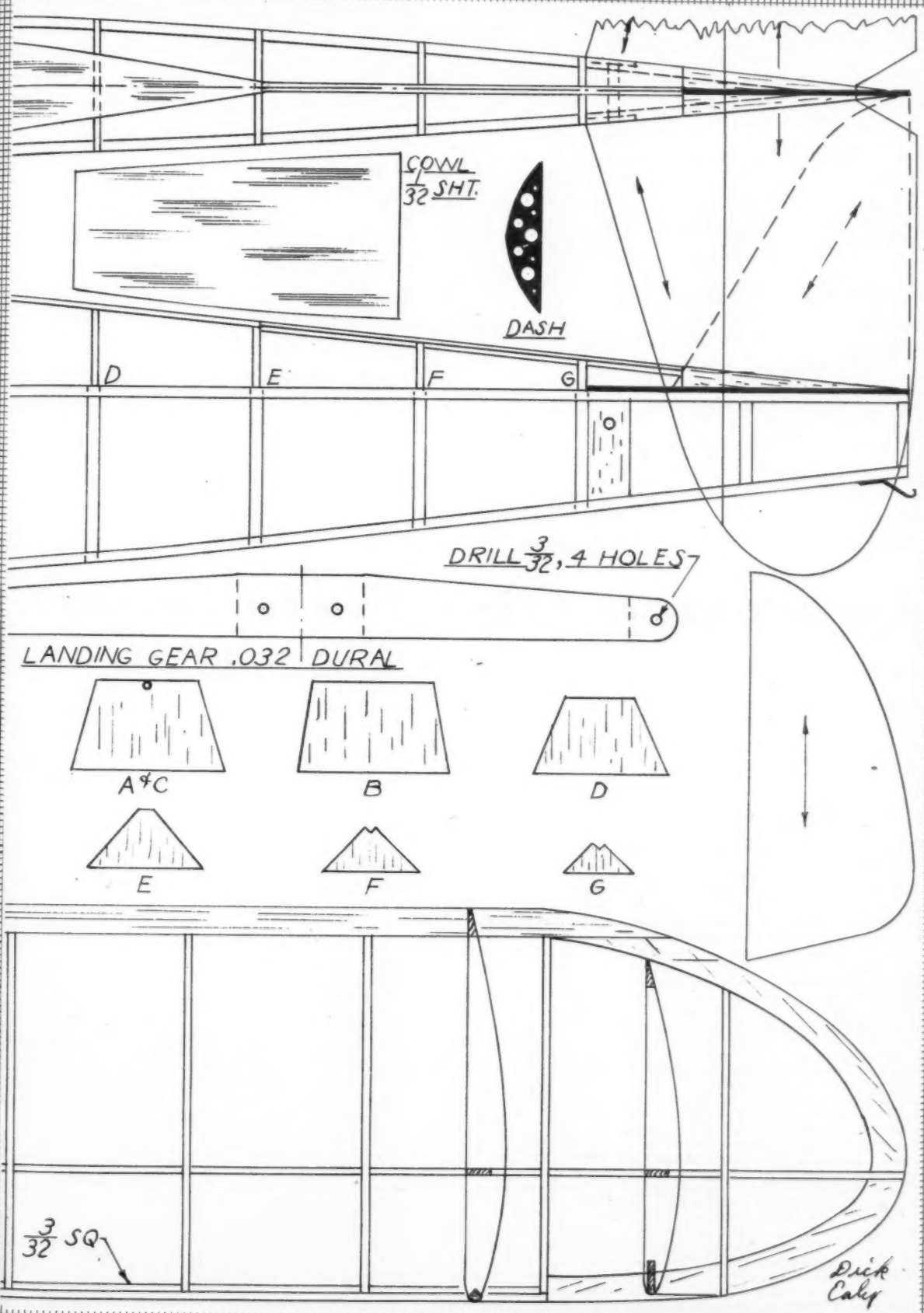
Make dashboard from 1/16" sheet. Cement printed dashboard on the sheet and trim. Bevel dash to lean forward and cement in place. Make 1/32" sheet balsa cowl from flat pattern and cement in place. A piece of 1/16" sheet hard balsa is used to mount landing gear. The landing gear is made from .032" dural and is bent as shown in front view. Bolt in place with 2-56 machine screws and washers. Wheels are also bolted on with 2-56 screws. This landing gear is just like its big brother, the *Cessna* light plane, which is made of spring steel. A celluloid or steel wire landing gear may be substituted. Add side stringers last and cover body with tissue. Spray paper with water to shrink; then brush on two light coats of silver dope after paper has dried. Add the celluloid windshield and side windows last. A pair of 3/32 dia. dowels are cemented on top of cabin to cradle wing.

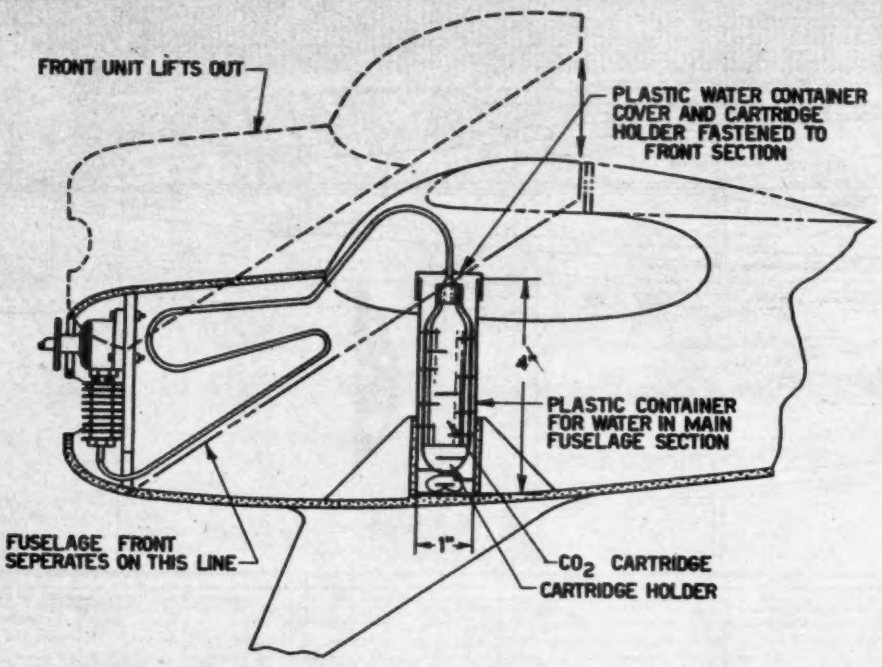
Carve prop as shown and mount on 3/4" dia. plug with .032 steel prop shaft. The motor is six strands of 1/8" rubber that is dropped through nose and hooked on 3/32" dia. dowel which should be installed during fuselage construction.

Make wing in one flat piece. Notch spars at center and form the dihedral. Raise one side 5" and add 1/16" sheet balsa splices. This makes 2 1/2" dihedral on each wingtip. Cover and shrink tissue; then brush on one light coat of clear dope.

Attach wing with rubberband and balance by holding wingtips at main spar. Hand glide model, than hand wind for test flight. A little rudder makes model circle after rolling out on top of flight. You can make model loop by warping elevator up 1/32" and adding more power.


PLUG
NOSE BLOCK
USE 1/16 SHT. EXCEPT AS NOTED
3/32 DOWEL
.032 BRASS
A
B
C
3/32 SQ.
PROP. 5/8 x 1 x 6 1/2
L. WING SHOWN
R. WING OPPOSITE
WINDSHIELD
SPLICE
2-56 SCREW


COWL
1/32 SHT.
DASH
D
E
F
G
DRILL 3/32, 4 HOLES
LANDING GEAR .032 DURAL
A & C
B
D
E
F
G
3/32 SQ
Dick Cahy


FRONT UNIT LIFTS OUT
PLASTIC WATER CONTAINER COVER AND CARTRIDGE HOLDER FASTENED TO FRONT SECTION
PLASTIC CONTAINER FOR WATER IN MAIN FUSELAGE SECTION
FUSELAGE FRONT SEPERATES ON THIS LINE
1"
CO_2 CARTRIDGE
CARTRIDGE HOLDER

Improving CO-2 Performance

by Roy L. Clough, Jr.

AS it is sold over the counter the Herkimer CO-2 engine is set to run approximately 20 seconds. By unscrewing the cylinder a short distance this run can be extended to about 1 min. Now it is possible to nearly double the run of these little engines with a very simple gadget, but before we describe it let's examine the factors affecting the performance of this type of engine in order that we keep out of trouble by knowing what is being done and why.

The CO-2 motor is an expansion engine. Thus it belongs to the same class as steam and compressed-air engines. Instead of pressure being generated over the piston, as in internal combustion engines, the expanding gases which drive the piston are fed in from an outside source. In the case of the engine we are discussing this pressure is supplied by a seltzer cartridge. Since the power developed by any expansion engine is directly proportional to the expansion of gases supplied from its reservoir, let's examine the cartridge itself and see what happens when it is used to run the engine.

The power cartridge contains gaseous and liquid carbon dioxide under a pressure of about 900 lbs. to the square inch. At one end is a thin metal disk set in a rubber seal. The holder into which it is inserted is equipped with a piercing point to release the gas into the line and a gasket to prevent leakage into the air.

This is how the engine operates: When the thumb-screw is turned up the cartridge seal is pierced; backing the screw a trifle clears the point and pressure is released into the cylinder feed-line, which slams shut a small ball-valve in the cylinder head and prevents leakage. When the propeller is flipped to start, the valve lifter—which is the tiny extension of the piston you see through the ports—lifts the ball valve off its seat and admits a small quantity of gas under high pressure and promptly drives the piston downward until it clears the exhaust holes. The momentum of the propeller brings the piston up again, and the cycle is repeated as long as sufficient pressure is maintained.

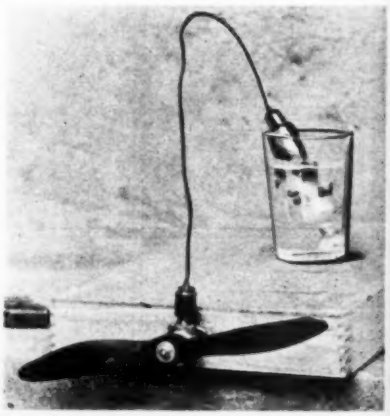
As the engine runs the pressure in the cartridge is rapidly lessened—and here is where we begin to lose a considerable amount of the possible power in the container. This is due, not so much to the factor of decreased pressure, as to self-refrigeration of the expanding gases which causes the pressure drop.

When a gas under pressure is allowed to expand it absorbs heat. The carbon dioxide gas in the cartridge is expanding rapidly as the engine runs, and as it does so it absorbs heat from the metal with which it is in contact. This is why frost forms on the cylinder and cartridge of this engine. It is water condensate from the air. In an effort to correct for this refrigeration the manufacturer has incorporated cylinder fins in the design. These fins operate just the reverse from the heat exchangers used on air-cooled internal combustion engines and absorb atmospheric heat instead of radiating engine heat.

However, the real difficulty lies in the fact that CO-2 is a very easily solidified gas (the liquid state does not exist at ordinary pressures and temperatures) and is quite capable of subliming itself by the expansion of a portion of its volume. A good demonstration of this effect may be had by adjusting the motor to run at maximum speed. When started, small bits of solidified CO-2 are thrown out of the exhaust ports. After a few seconds the pressure drops below the point where sublimation can occur and the engine runs normally. Now, although it cannot be seen, there is excellent evidence that this solidification of a portion of the energizing gas occurs in the cartridge as well. Proof is that the engine, if allowed to run at high speed until it stops of itself, can be made to run for quite a few more seconds if the cartridge is allowed to set for several minutes before making the attempt. Thus we see that if maximum efficiency is to be obtained, it is necessary to prevent self-refrigeration of the propellant gas.

Now this is very important: When we say prevent refrigeration we mean put back into the cartridge the heat it loses

(*Turn to page* 61)



WEST COAST TIPS

by JOHNNY DAVIS

WE RECENTLY went out flying with Phil Babcock and Bob Pelton, two of the original *Hollywood Flying Tigers* of pre-war control line vintage, and the nucleus around which the now famous "Snafu Club" has formed. These two fellows are real flyers. They also belong to the old school that says airplanes shall still look like airplanes and give good performance. Bob is just learning to fly upside down, because he held out for a ship that would look like something.

We decided to go down to Santa Monica to fly. The Santa Monica Club, under the auspices of the Junior Chamber of Commerce, have set up one circle on the parking lot of the baseball stadium at 14th & Colorado. The surface is asphalt and swell for ships with a gear. Next to the Santa Monica Club's circle is the Bay Cities Modelers' Circle. Usually there are 10 to 20 modelers down every Sunday, winter or summer, and a fine time is had by all.

There are a few celebrities down, too. One of the most ardent builders and flyers is Colonel Mears (we hope our spelling is correct), who was C.O. of the famous 57th Fighter Group, well known to all air force personnel in the ETO. He is holder of quite a chestful of decorations and a veteran of more combat missions than he cares to talk about. All of that is behind him now, and you would never even suspect that he was even old enough to have been in the war when you see him trying to get a sick engine in the air.

Walter Luther is the boy responsible for getting the site of the circle. He is A.M.A. leader member in the area and usually puts on one of the year's best contests.

To get back to the flying—it was a beautiful, clear day with hardly any wind, and flying was brisk. About 2 p.m., however, it became necessary to close up shop because the local baseball team had a game scheduled and needed the parking space. So we piled into the car and headed back towards Hollywood on Wilshire Blvd. When we reached Beverly Hills Country Club we decided to take a cut-off over to Sunset Blvd. Oh, happy day that we did, because as we turned left and headed down the street past a school we heard the old familiar B-z-z-z.

After listening a moment we decided that the engine was being run in the back of the school, so we drove back until we saw a driveway and headed in. Sure enough, and almost too good to be true, we saw 6 fellows and ships with lines strung out in the back playground. There was a catch, however. Only 52½ ft. lines could be used. Our hearts sank since we used nothing less than 60 ft. lines and would rather have seventies. But the ball started rolling again when the boys said we could fly on the front playground, which had plenty of room. Away we went exploring—and sure enough there was a beautiful field! It was covered with concrete that had some sort of cork composition on it, and almost the size of a football field.

Wow! What a day! We were so tired from flying that when night came we could hardly move.

You see, the reason we had to drive almost 40 miles to fly is because some character who designed a muffler went to the City of Los Angeles and convinced the Park Department that only ships with mufflers should be allowed to fly in the park at Crystal Springs.

We want to say that the muffler idea is good where it is necessary in order to fly. However, at Crystal Springs, the only complaints that came in did so when jet-powered aircraft were flying, not reciprocating engines. For this reason we feel that well enough should have been let alone and just barred the jets.

We personally went across to the first street on the other side of the Los Angeles River from where the planes were flying and listened while the engines were wide open. We could see them in the air, but there was so much traffic on Riverside Drive that we couldn't hear a thing. That is, until a jet took off. Then a woman came out of her house mad as a wet hen and said something about "those model planes are certainly a nuisance!" She now thinks they are all as noisy as a jet and therefore she is down on all model planes; and there are thousands of people just like her who are stopping modelers everywhere. Now there is a sign at Crystal Springs which states: "No Model Flying without Mufflers. No jet-powered models allowed."

Are we going to let every field in existence be legislated out of our hands before we get sense enough to do something about it? Mufflers are one answer, yes, but the cost is prohibitive to the kid who gets a small engine and a kit that costs only a couple of dollars. He just can't put out that kind of money—and make no mistake, he is the modeler of tomorrow!

Well, we have had our say, we certainly hope somebody will pick up the ball and carry it.

* *

We went to the *Los Angeles Aero Modelers'* Free Flight Contest, November 9 at Western and Rosecrans. We have been throwing little slams at the *Aero Modelers*

(Above) Les McBrayer's Class III record breaker Les Go, which holds AMA Open title with 120.80 mph, is powered by McCoy 29. (Left) The great "Madman"—J.C. "Upside Down" Yates—with some of the trophies he accumulated during the past year

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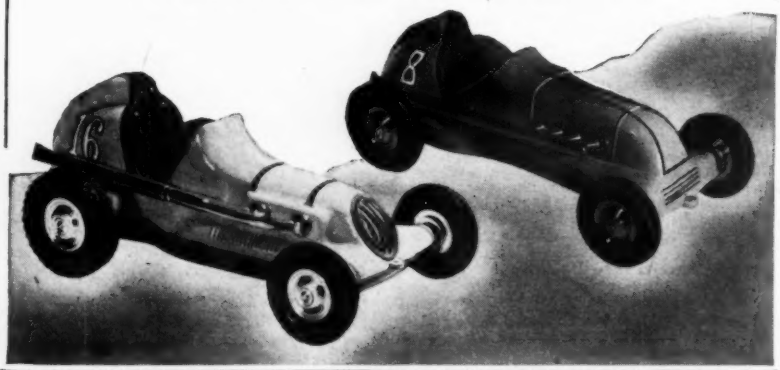

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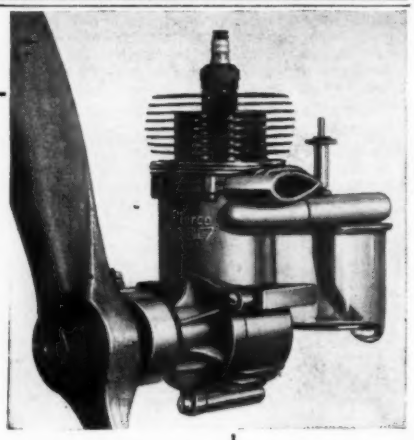

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A practical engine muffler designed by Marty Johannes, shown holding his model. The muffler is of aluminum, weighs 3½ oz. and quiets motor so it can't be heard beyond 100 feet.

lately because of the slipshod way in which the A.M.A. sanction in the last control line meet was handled. Well, we take it all back when it comes to free flight. These boys put on the best free flight meets in the country. If they had a decent site where the wind didn't blow 30 mph after lunch, these fellows would be a safe bet to have over 400 entries every time they threw a meet. As it is they had at least 200. They have the most efficient way of getting flights in that we have ever seen:

The processing tables are located along the flight pit line. When a man is ready to fly, he processes his ship and then gets in line to fly. About 100 ft. out from the process tables is an official who receives all the cards in order from a messenger at the process table. As a man comes up to fly the official hands the contestant over to a timer and gives the timer the contestant's flight card. After the flight the timer takes the card back to the judge, who turns the card back to the process table. In this manner a contestant never gets possession of his card. Such procedure would have avoided a lot of grief at this year's Nats.

* *

Seen at contests around lately:—Wally Simmers, the old Chicago kid, looking over western wares . . . Johnny Casburn, demonstrating his Over-easy, and it sure does go over easy . . . Mel Anderson and his *Spitfire* were noticeably present. A very nice looking engine . . . Joe Mechol still makes pretty ones . . . Clyde Bracy with a beautiful Sailplane job . . . Oldtimer Bob Smith was back after having been out of circulation for over a year . . . "Grandpappy" Frank Greene was also present, always helping in some capacity or other . . . "Champ" Paul Gillian was cranking up that efficient-looking "C" job of his in a business-like manner. We later observed it hung on a thermal and counting up time like a bookkeeper . . . We also ran into Frank "Pappy" Davis, his son Denny, and young Ada Davis, who recently went and got herself hitched. Yep, he's a modeler all right, name's Ralph Loveland. Belated congrats to both of you.

* *

We made a butch in our results from the Nationals when we named Davey Slagle as having won his Junior Precision Championship in a ship powered by an *Orwick*—definitely a miscue, as it turns out Davey was flying one of Bill Atwood's new *Super Champion Model J.H.* Bill, we are sorry this happened as we think of you as one of the grand guys in the hobby, and we think you make a ding-dong good engine, too.

* *

Our old friend Jim Walker journeyed all the way to New York to put on demonstrations in the Hobby Show late in November. After a busy two weeks there, Jim felt the need of a vacation and took it in California, where he had shipped a great deal of model equipment (including his famous R.C. plane) to keep occupied.

* *

There is a lot of activity around about

the Ontario Skyhawks Model meet. Everybody in Los Angeles must be planning to go. We can say this anyway—Woody Woodward and his boys are going all out to give with a good meet. Even to the extent of paying precision judges from the S.C. Congress to come out and give proper judging.

So long everybody, for now.

Changes in AMA Contest Rules for 1948!

THE following rules have been established by majority vote of the AMA Contest Board and become effective January 1, 1948.

GENERAL: Contest Directors can compete in their own meets (AA or smaller) if other Contest Directors are available to take over. Team entries must compete in age group of the oldest team member. Proxy flying okay if Contest Director believes builder is physically disabled. Only one model can be entered per event (all types and categories). Flying wings (rubber and gliders) classified according to 2/3 projected area.

INDOOR MODELS: No changes.

ALL OUTDOOR FREE FLIGHT: Ten minute flight limit. Longer flights recorded as ten minutes with no penalty. Total 3-flight time instead of average.

OUTDOOR GLIDERS: Hand launched —no wing loading. Total best 3 of 9 flights. Towline—wing loading 4 oz. per 100 sq. in. projected area. Cross section $L^2/200$. 3 flight total time.

OUTDOOR RUBBER: Landing gear required but hand launching okay for record. Wing loading 4 oz. per 100 sq. in.

ALL GAS MODELS: (for both Free Flight and Control Line) 4 classes: A—.000 to .200; B—.201 to .300; C—.301 to .500; D—.501 to .650; new exhibition Class E—.651 to 1.250 for Radio Control, Flying Scale, etc. For 4-cycle engines, 60% of actual piston displacement will be used for competition classification.

FREE FLIGHT GAS: All free flight gas models to R.O.G. for record—no cross section, no wing loading. Power loading 100 oz. per cu. in. piston displacement. 6 attempts to make 3 official flights. Unofficials not recorded. "Attempt" or "unofficial" where engine run exceeds limit, flight less than 40 seconds or models collide in flight. On-the-spot decision up to flyer in case of collision or less than 40 second flight.

CONTROL LINE SPEED: Minimum of 2 lines for safety. Control handle limited to 6 in. beyond hand of flyer. Speed computations to be made on standard lengths of lines: Class A—42 ft.; B—52½ ft.; C—60 ft.; D (and jet) —70 ft. Pylon required. Fly 3 laps before timing starts and fly official distances of 5 laps for A; 8 laps for B; 7 laps for C; 6 laps for D. 3 timers for official with 1/10 second or better watches; .2 second maximum variation between timers.

NEW CLASSIFICATIONS: Jet speed class added. Processed and timed same as Class D gas. Jet engines limited to 1¼ inch diameter inside tail pipe.

Compressed gas (CO-2) Class added. Duration records to be official. No wing loading; no power loading; no cross section. One cartridge of standard type per flight. No heating of cartridge beyond body temperature. No restrictions on engine design or size.

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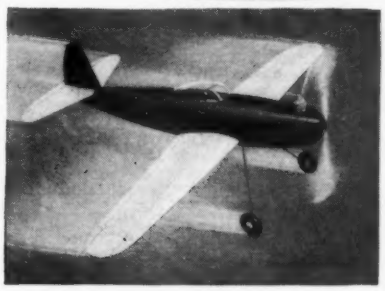
BOB TUCKER

The average model builder needs no introduction to Bob Tucker, World's record stunt flier, winner of 1947 National open class stunt event recently held at Minneapolis, Minnesota.



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REMEDY FOR STRIPPED THREADS

By RAY RUSHER

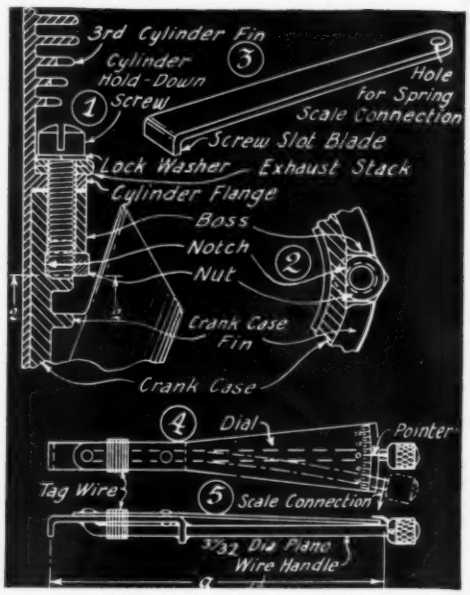
THE usual remedy for stripped threads in the holes of the crankcase that receive the cylinder hold-down screws is to purchase a new crankcase. The *Herkimer O.K.*, engine, for instance, has this type of cylinder-to-crankcase connection. A new crankcase is rather expensive compared to total cost of the engine, even on a trade-in allowance basis. In some engines it also requires purchase of a crankshaft fitted to the bearing in the crankcase.

A much cheaper method which requires only two screws with nuts (size 6-32 x 9/16" on an *O.K.* engine) and a half hour's time is here described. File a notch as in drawings 1 and 2 below the boss in which the threads are stripped to receive a nut having one corner filed off almost to the threads. The original shape of this corner is shown dotted in No. 2. File the notch no deeper than necessary as the filing thins the crankcase wall.

With an electric hold-in-the-hand type of motor provided with a 1/2" or 3/4" diameter Carborundum grinding wheel, grind a notch in the third cylinder fin similar to notches in the first two fins so a longer screw than the original can be inserted through the exhaust stack and the cylinder flange. Also grind a notch in the fourth fin if necessary. Drill the stripped threads out of the boss with a 9/64" drill so the screw will slide through it to enter the nut. Use steel screws rather than brass because brass has a higher coefficient of expansion than the material of the cylinder and crankcase and will, therefore, loosen somewhat with temperature rise.

Use fillister head screws which can be turned with an ordinary screw driver. Then tighten the screws with a special lever type screw driver shown at 3. It is made from a strip of 3/64" x 1/4" steel with a screw slot blade bent at right angles on one end of the handle. This tool is preferably hardened after it is bent, although if a tough steel is used to make it, it need not be hardened.

Be sure to tighten both screws equally to prevent compressing the cylinder gasket more on one side than the other as this throws the cylinder out of alignment with the crankcase which may result in binding of the piston in the cylinder and leakage of compressed fuel vapor from the crankcase. If you want to make sure both screws are tightened with equal torque, connect a spring scale to the outer end of the special screw driver. The scale should read 5 or 6 lbs. for 6-32 screws on a lever arm 2" long. The "inch-pounds" torque is then read 10 or 12 (5 or 6 x 2).



A handy "torque wrench" can be made as in 4 and 5 if desired. The average modeler will find this wrench very useful many times to tighten screws evenly without overtightening them, or to check the torque of screws already tightened. The dial on the wrench is directly readable in inch-pounds by calibrating it with a 25 lb. spring scale. Hold the screw slot blade in a vise and with the scale hooked to the handle, bend the handle at different angles and scribe marks on the dial at different readings of the scale. Multiply these by the dimension *a* and mark result on the dial. For instance if $a = 3$", a 1-2/3 lb. reading on the scale corresponds to 5 inch pounds on the dial.

The handle of the wrench is secured to the flat strip by bending one end of each and extending the handle through two holes drilled in the flat strip. The dial is riveted to the flat strip and a wrapping of tag wire holds the handle in place. The strip, handle and dial are then soldered together as an integral unit.

While only one boss of an engine has been illustrated and described, the stripped thread remedy is of course applicable to those bosses which receive the screws for mounting the crankcase cover in place, or any others that may be stripped and have sufficient space below them to receive either a full nut or one with a corner cut off as above described.

Testing Gas Models

(*Continued from page* 13)

jobs are best given the two-handed treatment, the left hand being placed under the C.G. while the right supports the fuselage at a point just forward of the tail. In either case the technique is the same. Run into the wind, and as you feel the model lifting in your hand give it a toss forward, steering it by feel into the proper glide path. When using the two-handed launch, let the model lift from your left hand but retain control with the right until the final forward shove is given and the ship goes off on its own. If you have had no practice at this you will have to cultivate the feel, but it is easy to do.

Anyone who has ever hand-launched a glider, especially a towliner, knows the feel of a proper launch. Launching the model at too high an angle of attack—the most common error—puts it into a stall from the start and it merely mushes into the ground. Insufficient forward speed will produce the same effect. Too much forward speed, on the other hand, will cause the model to climb and stall; this is not as dangerous as it would be on a pushoff from the ground because the model builder, with his forward speed, can be running right under the ship to

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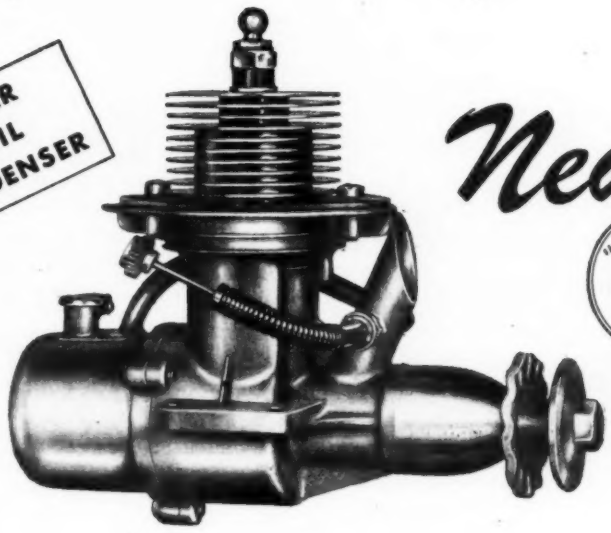

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While the "O.K." Hot-Head brings new simplicity to the miniature engine field, its pre-ignition firing subjects the crankshaft and bearing surfaces to unusual stresses. To counteract them, the Hot-Head has an extra heavy crankshaft .406" in diameter, a drop forged, heat-treated connecting rod and a bronze main bearing 1-5/8" long. This oversized bearing presents a greater area to withstand heavy impact loads and stresses. The result is a balanced engine that will give long life and high efficiency.

Don't take the chance of ruining your present conventional ignition type engine by conversion as the average engine of this type will not perform satisfactorily nor is it built strong enough for Glow Plug operation.

The "O.K." Hot-Head is so simple to operate that all you do is connect a 1½ volt battery to the Glow Plug until the engine starts. The battery is then disconnected immediately and the engine will continue to run on pre-ignition firing.

The "O.K." Hot-Head operates on special fuel as indicated on the instruction sheet with every engine. The Glow Plug can be purchased at your favorite hobby shop for 85c.

SPECIFICATIONS
Displacement — .299, B class. Bore — .760. Stroke — .660. R.P.M. — to 11,000. Weight with fuel tank, 7 ozs.

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catch it as it starts down. Nosing the model down too much will result in a dive, which the ship can generally recover from if not too steep.

After determining that the ship is in proper trim by giving it several straight line overhand glides, set the rudder tab to whatever side you want the model to turn toward and continue to glide it until a turn just becomes apparent. The angle of turn should not exceed 10° in a 50 ft. flight. The average model is set up to glide to the left as well as to fly to the left under power, although some builders use crossed adjustments, flying under power in one direction and gliding in the other. Too tight a circle put in during test glides may mean disaster under power, for at higher speeds and with the added force of engine torque the model will respond more readily to the rudder and a tight circle can easily develop into a fatal spin.

The model is now ready for test under power. Its performance during the glide test will have given a good indication of what to expect with the engine running. Since all the forces were acting through the C.G. during the glide, models with a large displacement between the thrust line and the C.G., or between thrust line and center of drag, are apt to behave a bit differently due to the redistribution of forces. Extreme parasol designs are apt to act a bit tail heavy due to the nosing-up couple created by the low position of the thrust line with respect to the center of drag; while high thrust line designs may display nose-heavy characteristics. A bit less incidence, or some downthrust added to the former, is a quick cure for the condition indicated; while extra incidence will correct the latter, assuming a zero thrust line to start with. The glide testing will, in any case, have proved the ship to be free of any aerodynamic characteristics that would normally tend to crack it up under power.

The first power flight should be made at between half and three-quarter throttle, depending on the power available. Since most modern contest models are drastically overpowered anyway, half throttle is a safe bet. Set the timer for about 20 sec., head the ship into the wind, and let it go. With the low power, it should take off after a short run and climb slowly at reduced speed. If because of thrust line settings or too much trim tab it shows a tendency to spin in, a bit of fast legwork may save it, although at low speed and low altitude not much damage should result from a spin that has little chance to develop into more than a power-on landing. This is one case where it is safe to refute the old pilot's adage about it being suicide to fly 'em low and slow.

Carry on power hops in the same way as the push-offs, giving more and more power on each flight until full-throttle performance is reached. Bugs not apparent at low speeds will appear gradually as the speeds go up, and by taking it easy they can be spotted and corrected as they appear. Adjustments for maximum performance should not be made until the ship has proven itself capable of handling full power. While many builders have their own pet adjustments, they may not be suited to all designs. For the first few flights, at least, let the model have its way—then try your own ideas. The main thing, however, it not to be impatient as the case of too many builders with new ships. Test the ship slowly and carefully. Catching the bad characteristics as they appear, and correcting them before they can do harm, is the best way to assure a consistent and trouble-free model.

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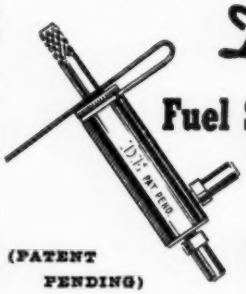

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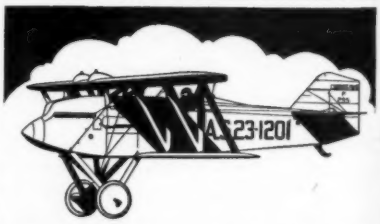

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World War I

(*Continued from page 23*)

rounding the lower spars and fitting over them a length of round steel tubing which was bolted to the fillet fittings. The lower wing was set at 1-1/2° dihedral.

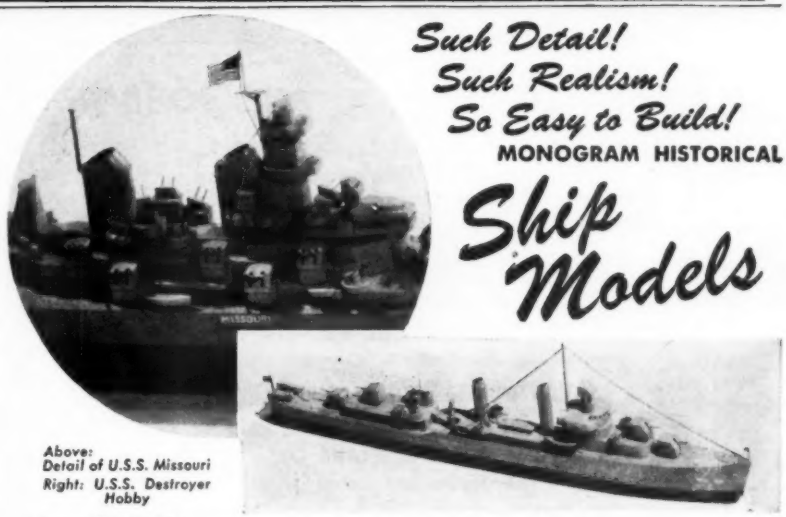
Two pairs of "N" shaped struts were used between the wings on each side. Parallel members of the inner struts were of streamlined section tubing 2-1/2 in. x 1 in., with the diagonal measuring 2-25/32 in. x 13/16 in. Outboard struts were of the latter size tubing throughout. The struts slanted outwardly from bottom to top when viewed from the front and were attached to the spars by means of typical German ball and socket joints.

Wings were further braced by the usual complement of flying and landing wires for a two-bay biplane. All were stranded cables. In addition, a drag wire was run from the front inboard lower strut socket to a fitting at the number one fuselage bulkhead. Another lift wire was included between the lower rear spar and fuselage joint at the lower end and the upper rear spar and center section strut at the upper end, perhaps as an afterthought.

Fuselage

Beautiful in line, the D.XII fuselage was as advanced for its time as the plane's wings were conservative. Thanks to its low drag coefficient, the fuselage probably contributed a lion's share toward the plane's final performance.

17 ft. 6-1/2 in. in length from number 1 bulkhead to sternpost, the fuselage had no internal crossbracing yet was not a true monocoque. Narrow and deep, the fuselage was made up of 8 milled longerons attached to a series of 10 plywood bulk-



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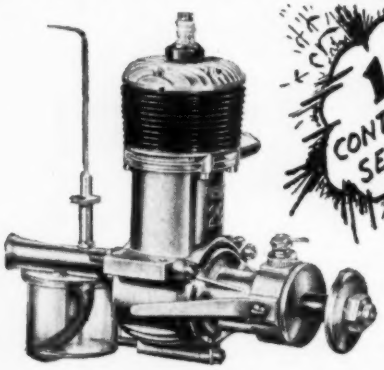

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heads to preserve the oval crossection. The first 4 bulkheads were much heavier than the rest because they were stressed to aid in supporting the engine, landing gear and wings. Bulkheads 1 through 3 came up only to the engine bearers. The remainder described the full crossection of the body. The D.XII's overall length was 21 ft. 5 in.

Engine bearers were made of rectangular sectioned ash 1-1/2 in. x 3-5/16 in. in crossection, lightened to an "I" section except where attached to structure. They projected slightly beyond the front bulkhead but at the rear were mortised into number 4 bulkhead, immediately behind the engine, so they butted against the rear ply.

The fuselage was covered with two thin 3-ply strip skins applied spirally one over the other and tacked to longerons and bulkheads. The structure was then covered completely with fabric and heavily doped.

Plywood covering applied to the nose of the fuselage was trimmed on a level with the engine bearers but completely surrounded the fuselage from the fourth bulkhead aft. The engine was covered on either side by louvered cowlings made of aluminum sheet and attached with quick release fasteners. Top of the engine was uncovered. The radiator, located in the nose, was entirely above the line of the engine bearers and was mounted forward of the first bulkhead on stamped steel brackets. The resulting exposure of the first bulkhead was covered by an aluminum stamped cowl which swept the lower profile of the fuselage up to the radiator's face.

Location of the cockpit placed the pilot just forward of the lower wing's trailing edge, giving him excellent visibility. The pilot sat on a stamped aluminum bucket seat, the back of which was a fabric web fastened to fuselage structure. A wide safety belt was attached to the lower longerons with fittings for shoulder straps. Parachute fittings were supplied in some late production Pfalz D.XII models.

The bucket seat was bolted to a steel tube framework and was adjustable in three positions horizontally and two vertically.

Cockpit interior of the Pfalz D.XII was a typical German hit-and-miss proposition. Instruments were attached to any convenient piece of structure without much regard for their accessibility in flight. Standard instruments were: a compass, tachometer, oil and air pressure indicators, fuel level indicators, plus an assortment of fuel pump and hand switches, selector valves and the starting magneto switch.

Armament, Engine, Controls

The Pfalz D.XII was equipped with 2 cowl-mounted synchronized aircooled Spandau machine guns, fired from triggers on the pilot's control lever. The engine was protected from blast by a steel channel under each gun. 400 rounds of ammunition for each gun were carried in a double ammunition box made of aluminum.

The engine was either a Mercedes 160 or 180 hp powerplant, depending on date of manufacture. Both types were equipped with oil coolers built in the bottom of the crankcase and supplied with fresh, cool air through a scoop on each side of the nose near the bottom of the fuselage.

The engine was cooled by a nose radiator located entirely above the propeller shaft. The brass header tank on top

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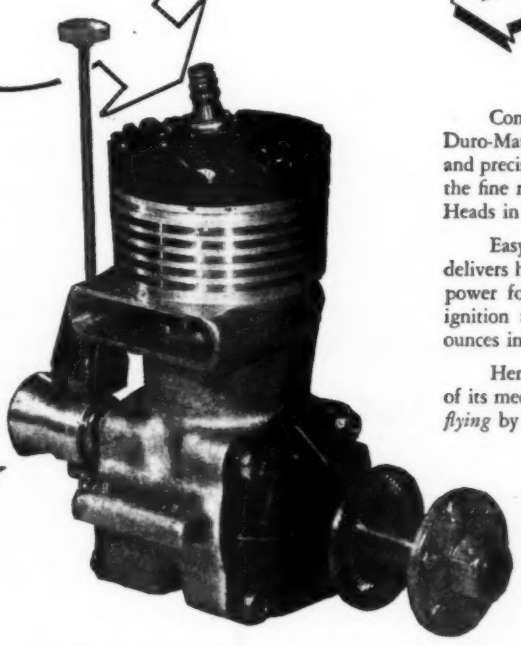

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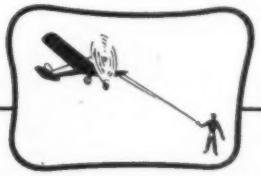

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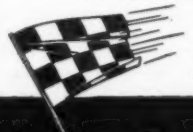

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formed an anchor plate for the vertical oval-sectioned brass radiator tubes. A baffle was fitted to the right side of the radiator to prevent spillage of air and loss of cooling effect on that side. The radiator was shuttered by hinged aluminum sheets, one on each side, attached to the rear and operated independently by cables from the cockpit.

The ship's fuel system followed accepted practice. Both tanks were located in the fuselage and worked under air pressure. The main tank, of 16 gallons, was fixed low in the fuselage under the pilot's feet. It was covered by a 3-ply cockpit floorboard. An auxiliary tank holding nearly 3 gallons was slung from the gun mountings. The oil tank contained 2 gallons of oil, approximating our SAE 50 in viscosity.

Controls consisted of conventional stick, rudder bar and throttle. Control sticks were fitted with the usual German double handles incorporating gun triggers, but were not always fitted with throttle controls. The off-stick throttle was a simple steel lever without ratchet, connected to the carburetor by a small diameter steel tube. Rudder bar was of welded steel tubing equipped with leather foot straps and was adjustable.

Control surfaces were actuated by stranded cables. Elevator cables passed through the stabilizer after leaving the fuselage. Aileron cables passed through the lower wing and were protected from structural friction by tubes of varnished paper. Where they turned to reach the upper wing they were run through steel encased aluminum pulleys. Aileron cables terminated at a long arm bellcrank of steel welded to the aileron structure.

Landing gear was of standard 2 wheel design with struts of streamlined steel tubing, braced with cables. Attachment was by means of steel plates screwed to internal structure. Tread was 61 in. and shock was absorbed by either rubber cord or steel coil springs as supply dictated. Tail skid was a heavy piece of ash with a channeled steel shoe and was not steerable. The skid was hinged about midpoint and fitted with a double coil steel spring to absorb shock.

Standard propeller for the D.XII was made by Heine, with a diameter of 2,780 mm., and 2,000 mm. pitch.

Opinions about the Pfalz D.XII will vary among World War I aviation enthusiasts wherever they gather to discuss the ancestors of today's fine aircraft. In spite of the pros and cons, it is a matter of record that the D.XII did a much better job than expected by those who flew it.

Actually, the D.XII didn't get a chance to demonstrate what a real thoroughbred it was. It reached the Front too late in the game to make an imposing record.

Book Review

JANE'S ALL THE WORLD'S AIRCRAFT ($20.00, The Macmillan Co., N.Y.C.). The latest (1947) issue of this comprehensive work has just been released. It contains an unusually large percentage of new material as compared with the 1945-46 issue. While Germany and Japan are naturally omitted, a host of new countries have been added. This year extensive coverage of American jet development was possible; such material could not be included in the 1945-46 issue due to Security restrictions.

As in all previous volumes, dimensions are given both in the metric and English systems, a feature that adds much to the book's utility.

The volume is printed on fine coated paper (as before the war), with the result that the many halftones show up to excellent advantage.

Scrap Box

(*Continued from page 8*)

fornia will do. However, there is more to a U-control job than just a fuel, or a plug, or an engine. It takes plenty of skill in design and flying to get over 120 mph. On the serious side, Jim Walker thinks the Glo-plug has possibilities in stunt because it eliminates weight, making possible the use of a smaller engine in the same ship, or greater aerobatic ability with the same engine-plane combination. Jim has been doing things with a wheel-less 19 ounce *Fireball*, with an *Arden .199* and a Glo-plug. Speed fliers will find—assuming that the Glo-plug proves out in all respects—that a reduction in weight means a reduction in wing area and hence more speed. As yet we haven't heard about the drawbacks. Incidentally, Glo-plugs are so sought after, we hear they have been bootlegged at $5 apiece in the Los Angeles area.

* *

If you have a yen for stunt but can't get the ship on its back that first time without plowing up the turf we refer you to Rogers Barton, AMA Contest Board Member, of College Station, Texas, who has a foolproof method for doing the trick. Just hand launch the model upside down! Simple isn't it. To say the least, you can get the feel of inverted flight without the half loop, or half outside loop, otherwise required. You'll have to take it from there. Okay, so you're upside down. What then? Barton, it seems, chops to a line and lets the chips fall where they may. Among his more potent statements: there isn't an indoor model in Texas; and, drop all the free flight rules (use any engine classes, but stick to them). However, Barton has been trapped into confessing that his club will feature an indoor glider competition. If the Texans do what they did in control line and free flight, the Yankees are going to sweat in indoor work.

* *

One Texan will love us for this: When Johnny Casburn stopped off in Arkansas to demonstrate some of his hot stunting, the local boys figured his loops looked a little like wingovers. Arkansas now divides loops into two classes: Texas loops (wingovers) and Arkansas loops (the McCoy—and we don't mean engines). Do we detect a hint of rivalry!

* *

If this sounds like too much control line—and what is there in free flight?—we suggest Gordon Light's idea for a Transatlantic gas model. For an old rubber man, Gordon, you amaze us! You don't have to try that hard to boost free flight. Anyhooo, says Light, a Diesel-powered job, enough fuel for 50 hours, west wind to drift it, a directional compass tied in with the rudder to hold it on course (the Dutch and Swiss do this in soaring competition), catapult launch, clean crate, low-wing loading, automatic gadget to trim for best L/D as fuel is burned. Try that on your drawing board. Might be a good idea to put in plenty of west wind. A throttle arrangement tied in with a barometric device might help coasting from thermal to thermal. They must have thermals over the ocean. It might work at that. Any comments? (I'm glad you asked that question, Sir.)

* *

To come down to dry land, Charles W. McCracken of Greenville, Ill. is a confirmed tinkerer in control line gadgetry. Among his developments are a powered dolly to help struggling ground-lovers to get up in the world, a bellcrank that allows broad control in the middle range but which applies progressively more elevator with drastic movements of the handle. This is said to be useful in emergencies. But McCracken's killer-diller is called *Oxy-Boost* (Patent applied for). It consists of a small tank which is attached to the back of the operator. A tube runs from this tank to the control handle and then down the wires to the motor. To decrease drag one of the wires runs through the tube. A special type valve is built into the control handle so that the operator can control the flow of oxygen. The action of this valve has

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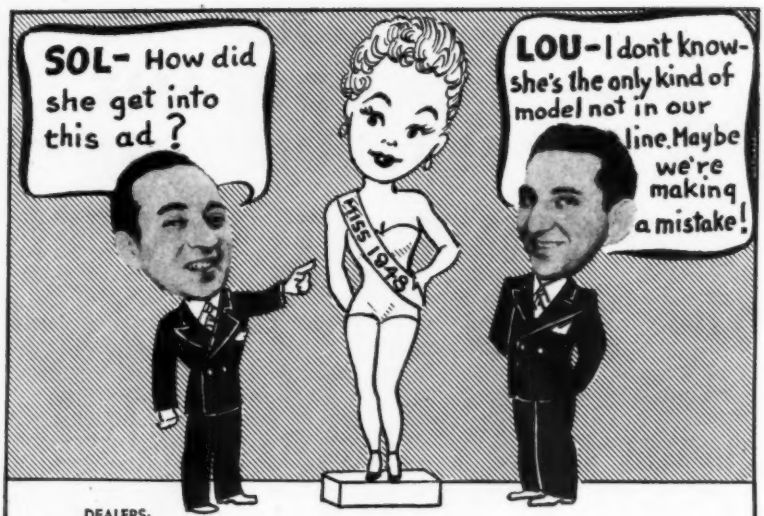
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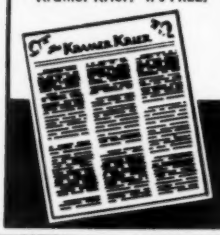

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the same effect as that of a butterfly valve in a regular carburetor, so that as well as getting more power the device can be used for motor control. For jet jobs it can be used to carry the fuel to the jet, thereby doing away with the tank and eliminating starting problems. Personally, we don't have that much of a pioneering spirit, or the intestinal fortitude to play around with stuff we don't understand. We suggest it would be a good idea, for the sake of a whole skin, to leave this kind of pioneering to guys like McCracken who know what they are doing.

McCracken's letter reminds us that many a thing said in jest turns out to be true. What especially intrigues us was his reference to a line running through a tube. In our diehard days (and they still stagger on) we used to kid the control liners by saying we wouldn't build one until they could roll and had telescoping or hollow lines, so one line could be passed through the other to minimize drag. Well, Walker rolled a *Fireball*, even if the rig was an eye-sore. Now, just to pull something foolish off the top of our head, could you anchor the outer line and do the controlling with the inner one? Maybe we should stick to free flight.

* *

Speed always makes you think of a U-control model. But some guys show plenty of speed on the workbench. There used to be a member of the old *Skyscrapers*, a policeman, we think, who built Class C jalopies overnight (does the missing persons bureau know his name or whereabouts?). But the zaniest building spree on record belongs to Wally Fromm (surprised, Wally?) who batted out 23 fuselages in an evening. Wally and his sidekick, Ed Lidgard, have done a tremendous amount of development in sheet balsa construction. Did you see their stuff at the Nationals? 1/32" sheet makes fine fuselage sides when cut out for lightness and reinforced with crosspieces for supporting the paper. These boys have been using 1/64" sheet with success in making cambered stabilizers, and Fromm is convinced he can make an all-balsa wing lighter than we can build them from spars, edges, ribs, and paper. Anyway, the 23 fuselages (bet he hasn't built half the wings for them) were for a small contest type that can be built complete in 6½ to 10 hours, allowing 1½ hours for prop hinges, etc. They are so light that 57% of the weight is rubber, and durations have run as high as 3:15 in the evening. (P.S. A jig saw and sander help a lot!)

Mass production and an inquisitive mind is a combination that gets results. With so many models gathering dust, Lidgard and Fromm decided to run some tests in an armory. For the models in question an 11 to 1 gliding ratio, a sinking speed of 2 ft. per second, and a gliding speed of 15 mph. were found average. Lest this annoy the theory boys who have nothing that glides less than 20 to 1, Walt Good mentions that some of the builders around Washington, in a similarly curious mood, took to launching gas models off an embankment. If these impromptu tests mean anything, it makes little difference whether the design is cabin or pylon, or if the finish is slick or the edges tattered. They all glide pretty much the same.

* *

Under the heading of "is-our-face-red" is a letter we addressed, in error of course, to pore old Ocie Randall, Fresno, as "Miss" Randall, although we knew of Ocie's balsa butchering for the last ten years. "I must correct you in addressing me as 'Miss,' as I am quite a man," declares Ocie, "having four children in age from 15 to 23 years. I now boast 45 years of life and still feel just as good as any of these whippersnappers who fly models. To prove it, I have 22 trophies, three medals, two placques and about 165 ribbons to show for my flying since 1936 in free flight exclusively, that I have won flying all over the state of California." How do you do it, Ocie, feeling as good as those whippersnappers, we mean? Ran us into the ground ages ago.

* *

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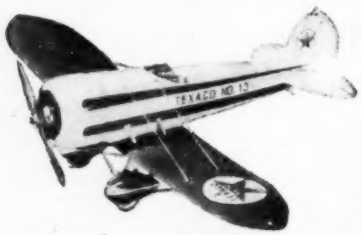

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(vertically not horizontally) and always a tough man to beat in rubber, sets us right as to the origin of the tensioner. We had always thought it was originated by Jim Cahill on his *Clodhopper*—the most efficient rubber model we had seen in National competition. Bob says it came over on some English models in 1936 or so and that he himself first used it here at the Junior Aviator Air Races in Cleveland on a 300 sq. in. "crate." These days, Bob is disgusted with rubber. Any 300 sq. in. job will go out of sight on one out of three flights, so why bother? Smaller jobs aren't the answer; they won't go out of sight but they can't win contests. Power must be limited, Bob claims, and payload carried. Gas or rubber, he is for heavier loadings. For gas, make the loadings 150 or 160 oz. and the flying junk heaps will have more trouble catching thermals. "I can see the Class C boys getting out their slide rules and muttering about 6 lbs. etc.," says Cahill. "My answer is: *Why have Class C in free flight?* A and B are tough enough for any contestant to fly in a day and there are too many events at the Nationals anyway." Bob, incidentally, has a good rule for telling an expert—should we say specialist?—in rubber. Indoor or outdoor, you can tell an expert by the length of his motor.

* * *

From England comes an interesting letter from George Temple, one of their old-timers and one of the world's best builders. George is bored stiff with the usual stuff and so has taken refuge in scale. He used to be interested in Wakefield—over there they go in for 3 min. motor runs—and sailplanes, for which he has an international reputation. He objects to sailplanes on the grounds that they last too long. His designs, typical of British practice, span from 7 to 11 ft. with loadings between 12 and 14 oz. It is impossible to wear out one of these ships in five seasons of flying. Temple's idea these days is a collection of super-detailed World War II scale jobs. Now 35 years of age, he figures that he can build 20 before he puts away the glue pot for good. These models are detailed right down to accurate structure, safety belts and throttles that actually cause the props to revolve. We have seen pictures and, believe us, the quality is out of this world. All these models are made from plans which Temple draws from examination of the real aircraft. The first, an FW-190, was bombed to dust on the continent; the second, an Me 163 rocket fighter, was recently completed. The current rage is a Fiat biplane fighter. Also a pilot, Temple has 700 hours on fighters including the *Spitfire*, P-47, etc., and even the De Havilland *Vampire* jet job. The P-47 rates tops with George; once he flew one in a test against a *Tempest*.

* * *

"There are signs—I might say almost ominous signs—that U-control will be much more popular in 1948," says Eddie Cosh, who was a member of the last British Wakefield team to come over. (Should we tell him?) At this year's nationals in England 20 U-control models competed, including a *Dynajet*, and the first control line club has been formed in north-London. U-control, he notices, does not seem to attract free flighters, but maintains its own following. The "old stagers" look on it with scorn and refer to it as powered yo-yo. What a shame, what a shame. Just when the Britishers were learning how to design and fly a good free flight model.

* * *

Won't somebody come to the rescue of free-flight? Anything new since the *Zipper*? We'd like to hear from anyone and everyone, even you U-control fellows. . . . In future issues we hope to have plenty of what's new from all parts of the country, all kinds of models included. Drop us a line, won't you!

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Air Ways

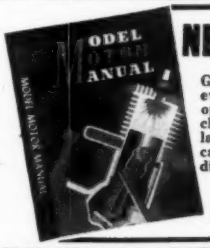
(*Continued from page 27*)

"any internal combustion engine, esp. a gasoline engine——". Then we tried to figure out what would be the proper classification for such diverse powerplants as: steam, CO-2, clockwork, and rubber. Next, a quick check showed that some companies making internal combustion power units include the word "engine" in their corporate title while others use "motor." All this left us just about where we were before the question came up. We will probably use the words more or less interchangeably, as does everyone else in model work, and trust the confusion won't become too great. Meanwhile, we hope our latest gas job will fly better as soon as we can install a new *motor*—er, that is, a new *engine* on its nose!

* *

Picture No. 1 shows a Class C rubber powered stick model built by Myrtle and Harvey Robbers, 5610 E. 17 St., Oakland, Calif. Mrs. Robbers is very active in contests on the west coast. She has also built a microfilm stick model with instruction from Michael Demos. The *Oakland Cloud Dusters* are very proud of Mrs. Robbers' talent and enthusiasm and wonder if any other women are interested in microfilm models.

S/Sgt. Thomas U. Kirley, Hqs. 7th Weather Group, APO 942, c/o Postmaster, Seattle, Wash. submitted No. 2 which is a 3/4 rear view P-51B. This ship is quite unusual in that it is completely built of plexiglas (340 pieces) with the excep-



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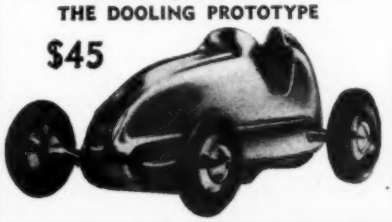

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tion of dummy engine, oil tank and spinner which are of balsa. The ship was scaled and built from pictures drawn by Sgt. Kirley in 30 hrs. The scale is 5/8"-1'.

The Vickers-Supermarine Attacker (Supermarine E 10/44) shown in No. 3 was built by Rene de Guire, 3 Champoux St., L'Abord a Plouffe, Montreal, Quebec, Canada from a 3-view plan and photos in Feb. 1947 M.A.N. Fuselage is two balsa blocks hollowed out, and wings are built up and covered with sheet balsa. Horizontal and vertical tail surfaces are solid balsa. This control line model is powered by a standard *Dyna-Jet*. Fuselage is insulated with fiberglas blanket and asbestos sheet. The wingspan is 36.375"; length 29.250"; height at rest 8.750"; and weight 3 lbs. 14 oz. Garth Beckett took the photo.

Fred M. Taylor, Edgewater Apts., Essex, Ind. sent in No. 4. It is a free flight model, CO-2 powered and has an 8" x 4" prop. In calm evening air the ship has averaged over 90 sec. per flight. The fuselage is made up of sheet balsa sides and is very rugged. It has a 30" span and the engine is run inverted. Total flying weight is 5-3/4 oz.

No. 5 is a successful helicopter built by Tom Bohman, 5624 Surrey Ave., Cincinnati, O. The ship was made from plans in Sept. M.A.N. Mr. Bohman found it quite simple to construct and states it is a fairly good flyer, rarely having a flight that reached a height less than 8 ft.

Donald J. Hollister, So. Rochester Rd., Mukwonago, Wis. is proud of his first gassie in No. 6 which was built a year ago. It is the *Yogi*, powered by an *Ohlsson 23*. The fuselage is partially planked and is equipped with skis for winter use. The coil is sunk in the noseblock to allow the batteries to be placed under the windshield. This helps solve the weight problem.

No. 7 is a scale model Pt-22 control liner made by Richmond Westlake, Oxford, Calif. (Edwin A. Gardner Jr. took the photo.) The plane has flap control and is very detailed. It is powered by Burgess M-5 with a laminated prop and is silver in color with yellow wings.

De Remington, 3221 Renick St., St. Joseph 40, Mo. contributed No. 8 which he designed and built, featuring a butterfly tail. The ship has 200 sq. in. wing area and weighs 14 oz. It turns in good flights and is powered by an *Elf Single* (.097). Since this picture was taken the ignition system has been taken out and been replaced with an *Arden* glo-plug, which gives the engine higher rpm's and reduces the plane's weight. The model has a red finish and M & M air wheels.

A. C. Olsen, Edgecliff, Spokane, Wash. submitted No. 9. The body is crutch design built around the motor mounts, firewall and landing gear of a *Tyro*. The top wing is also from the *Tyro*. The bottom wings are from a Falcon *Speedster*. The rudder is *Tyro* and the stabilizer is *Speedster*. It is powered by a *Rocket*.

No. 10 is a *Demon* glider constructed by Y. Van Hattum and built by Theodore Mast, Lippenhinzen, Holland. This model has been very popular in Holland. It has a wingspan of 160 cm. and flies very well.

Paul Nock, 19 Ten Eyck Ave., Albany, N.Y. sent in No. 11. The total time spent on this P-47 was 750 hours. Everything works on the plane including retractable gear, tail wheel, controls, movable landing lights, sliding hatch, etc. This model was displayed in a bond rally during the war—it gave the people an idea of what they were helping to buy and stimulated the sale of bonds. Span is 35", and the

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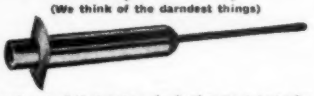

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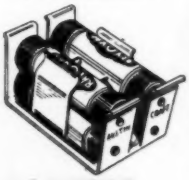

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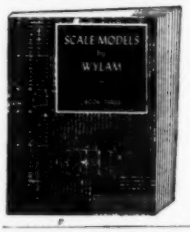

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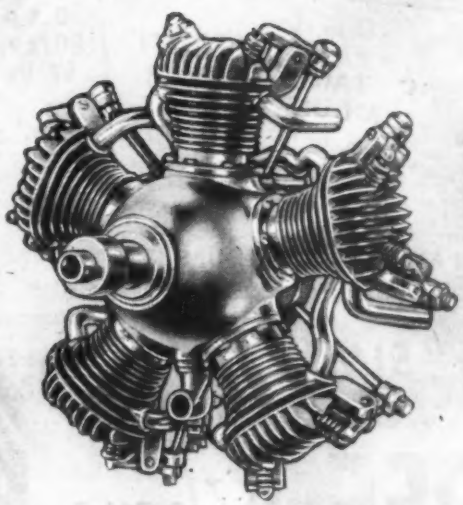

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The seaplane shown in No. 12 was built by P. Sandford, 110 Macpherson St., Semorne, Sydney, N.S.W., Australia. It has an excellent R.O.W. performance and is constructed with automatic elevators. Mr. Sandford didn't tell us how these operate, but we assume they are used to aid rapid takeoff.

News of Modelers

Reg T. Abbey, 82 Foster Rd., Redford, England, aged 26 and recently discharged from the Naval Air Service, is anxious to acquire a pen-pal. He would like one who will keep writing and not give up after a few letters, and one who is interested in any branch of model building. He also wishes to exchange kits and plans.

Palmer G. Wenum, Spring Valley, Wisc. would like to obtain all the older Cleveland kits from 1935-41. He particularly wants to get all their Thompson Trophy winners in 3/4" or in 1" scale, or just the drawings.

David Wield, 18 Bothsay Place, Bedford, Beds. England, desires to correspond with an American about 16 years of age who would be willing to exchange ideas, letters and trade accessories. He is interested in sailplanes and power flying, especially the larger stuff, and hopes to be able to build a radio control model some day.

Gilbert Rasmussen, 621 Adolphuse, Cornwall, Ont., Canada is interested in hearing from control line or free flight fans.

John Arnold, 25 Farnham Ave., Hassocks, Sussex, England, is a model enthusiast who would like to exchange views with a boy over here.

R. R. Cozens, Croftap, Costessey, Norwich, Norfolk, England, being unable to obtain copies of M.A.N. in his country, would like to contact a model builder in America interested in gas models of all types, gliders, sailplanes and also all phases of motor cycling. He wishes to exchange ideas, photos, plans and books.

J. Ramos, Merida, Mexico wrote us recently that a local dealer in Merida bought a number of low priced American engines and is now selling them at $150.00 each. And we here in the States complain of high prices!

CLUB NEWS

California

The *Albany Control Flyers* annual U Control contest was held at Tilden Regional Park in Berkeley, Oct. 17 with Berkeley Jr. Chamber of Commerce as co-sponsor and Paul Wallace of the A.C.F. contest director. The winners:

Junior Precision
Class A—1. E. Stiles 2. D. Hollfelder 3. J. Pedrotti
Class B—1. Bill Thunberg 2. Don Butman 3. Don Hollfelder
Class C—1. Eugene Stiles 2. John Harvey 3. Jack Douglas

Senior Precision
Class A—1. Ed Kroll 2. Jack Summer 3. Ray Regalia
Class B—1. Ralph Arista 2. Bob Griswell 3. Ray Regalia
Class C—1. Ed Kroll 2. Al Bazurto 3. F. L Bradford

Junior Speed
Class A—1. Leland Lutz 2. Bob Lane 3. James Freeman
Class B—1. Leland Mallory 2. B. MacKerracher 3. M. Brown
Class C—1. Lester Douglas 2. John Sofilos 3. Bill Powell

Senior Speed
Class A—1. Bill Richards 2. Dick Wrestler 3. C. Karpin
Class B—1. Bill Richards 2. J. Kyle 3. Arnold Nelson
Class C—1. J. Kyle 2. A. Flanders 3. Erick Moline

Team Event
1, Butman and Bratford 2. Thunberg and Skilling

The *Sacramento Skyoneers* held their annual free flight contest Oct. 5 at Mather Field. The results:

Class A—1. Jerry Johnson 2. Ed Wolley 3. J. Drobshoff
Class B—1. Jack Volponi 2. Joe Bilgre 3. L. Simonian
Class C— 1. Russ Watkins 2. Jim Liebee 3. J. Lenderman

* *

Here are the winners of the Bakersfield Annual Contest held Oct. 12:

Class A—1. Ken Neubeiser 2. Ray Acord 3. Ronald Mosier
Class B—1. Pat Regan 2. Bill Krecceck 3. Henry Vincent
Class C—1. Ralph Oberg 2. Paul Gilliam 3. Milton Ronny

* *

Following are the results of the *Los Angeles Aeromodelers* U-Control Contest held Oct. 5:

Speed
Class A—1. Newberger and Sharp 2. Frank Keb 3. Paul Conrad
Class B—1. Jim Whitlatch 2. Bob Behren 3. Roger Williams
Class C—1. Keith Story 2. Dick Grandell 3. Newberger and Sharp
Junior—1. Bob Behren 2. Dick Grandell 3. Frank Keb

Senior Precision
1. Don Gulatto 2. Bud Jamison 3. Bob Brown

Junior Precision
1. Jack Gilroy 2. Jim Milbeck 3. Dwight Miller

Flying Scale
1. W. Jackman 2. Cedric Galloway 3. E. E. Russell

Ladies Precision
1. Bunny Baldree

* *

The Gilroy Junior Chamber of Commerce picked a perfect day for their Free Flight Contest held Oct. 19. The winners:

Class A—1. Bob Hay 2. Doc Crane 3. Frank Rivera
Class B—1. Bill Maranville 2. Dutch Van Tassel 3. Dick Chamberlain
Class C—1. Dean Hughes 2. George Azevedo 3. Dale Root
Juniors—1. Vernon Gwinn Jr. 2. Fred Mosier 3. Gary King

* *

The *Fresno Control Flyers* held a dandy contest Oct. 26 and despite the fact that the boys were forced to hold it 15 miles away at the High School Field in Fowler, everyone said the trip was worth it. The winners:

Speed
Class A—1. J. Whitlatch 2. Bill Richards 3. Lee Lutz
Class B—1. F. Marshall 2. J. Whitlatch 3. Bill Richards
Class C—1. Mac Jurisich 2. Loyd Perisch

Senior Precision
1. Allen Simms 2. Jack Sumner 3. Robert Fritz

Junior Precision
1. Lee McKown 2. Alexander Petry 3. Alfred Lyon

* *

Results of the 21st Annual Model Aircraft Tournament sponsored by the San Francisco Recreation Department are:

Junior Division (Total Score)—1. Inar Enevoldson 2. Darrell Larks 3. Jack Ritner
Senior Division—1. Angelo Lo Castro 2. Charles Dorsett 3. Douglas Smith
Junior Division (Events)—1. Inar Enevoldson 2. Darrell Larks 3. Jack Ritner
Towline Glider—1. Darrell Parks 2. Jack Ritner 3. Larry Giordanengo
Hand-Launched Glider—1. Larry Giordanengo 2. Inar Enevoldson 3. Dale Parks
Senior Division (R.O.G. Cabin)—1. Angelo Lo Castro 2. Charles Dorsett 3. Eddie May
Towline Glider—1. Charles Dorsett 2. Angelo Lo Castro 3. Frank Devlin
Hand-Launched Glider—1. Douglas Smith 2. Bob Risvold 3. Eddie May

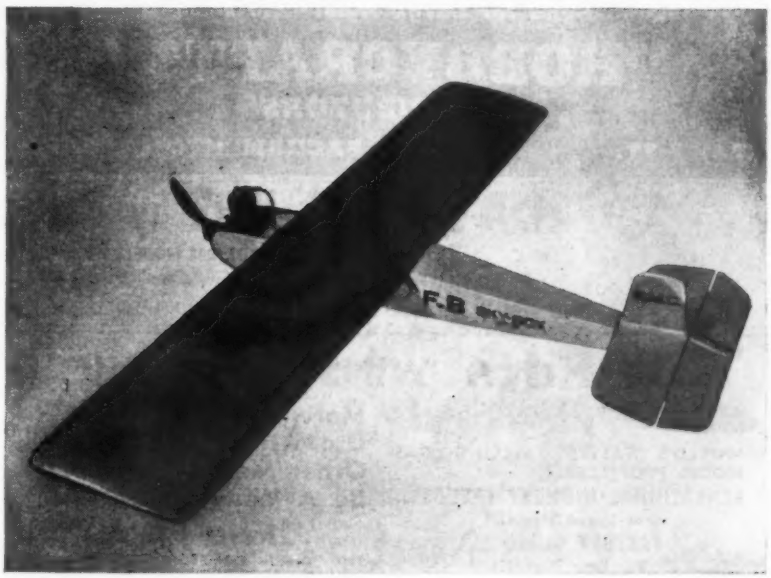
Illinois

The *Aurora Aeronuts Model Club* recently elected the following officers for 1948: Chairman, Stanley Bernard; Sec.-Treas., Larry Jensen; Field Director, Ray Armbrust; Contest Director, Maurice McEvoy; Gen. Directors, Harry Kelly and Babe Mabrey; Publicity, Hart G. Betts. The club will hold a U Control Meet in July, and a Free Flight in Sept. Anyone interested in joining this club should contact Hart G. Betts at 7 Fox Promenade, Aurora.

Announcing

F&B SKY BOX

Trainer and Stunt Plane



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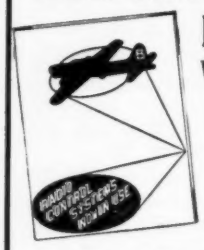

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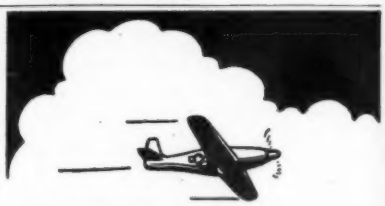

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Due to conflict in dates of model meets during 1947, the *Aeronuts* suggest that all model clubs in northern Illinois, southern Wisconsin and eastern Iowa contact Hart G. Betts, giving their tentative contest dates for 1948. With these dates at hand, a suggested schedule will be laid out and distributed to all clubs. Nothing will be done without full approval of all clubs interested. The object of this schedule is to coordinate a well-planned contest season in this area. *(Sounds like a smart idea to us. . . . Edit.)*

Massachusetts

Results of the Annual U-Control Contest of the *Lawrence Gas Model Club* are:

Speed

Class A—1. Edmund Chulada 2. Andy Alvino 3. Ed Smith

Class B—1. William Busta 2. Anthony Fredricks 3. Al Fredricks

Class C Ball Bearing—1. John Chulada 2. Bill Busta

Class C Sleeve Bearing—1. Sam DiNoto 2. J. Chulada

Stunt

1. Bob Bachmann 2. Ed Chulada 3. John Chaukmanian

Scale Stunt

1. Sam DiNoto 2. Walt Leonhardt 3. Al Fredricks

Montana

We received news of the newly organized *Anaconda Modelers' Association*. The officers are: Robert S. Carroll, Pres.; Edward Sager, Vice Pres.; Ernst Landerville, Sec. & Treas. The club boasts of 26 members and will soon be a chapter of the A.M.A. In favorable weather six classes of U-Control contests are held, but during the winter indoor rubber contests are popular in the local Junior High gym. The club meets 1st and 3d Thursdays of each month in the Montana Hotel. Penalty for failure to attend meetings, except in an emergency, is $5.00. Plans are being outlined to sponsor a U-Control contest next June between the Eastern & Western part of Montana.

New Jersey

The *Jersey Model Club* celebrated their first anniversary last Oct. with the election of the following officers for 1948: Vince Sabatino, Pres.; Pat Collura, Vice Pres.; Edward Ohland, Sec.; Michael Bonelli, Treas.; Joe Manina, Sgt. at Arms. The club is an A.M.A. chapter and interest is centered on U-control, with a few race car enthusiasts. Meetings are held weekly at the Garfield Model Supply, 245 Lincoln Place, and Sunday flying at the club's own field (20th Century Field, also in Garfield).

* *

Here are the results of the Second Annual Model Flying Fair, held on Oct. 26 and sponsored by the Exchange Club and Union Warinanco Park, of Elizabeth:

Senior Stunt Event—1. Jack Seller 2. Wilbur Hall 3. Daniel Maas

Junior Stunt Event—1. Clifford Schaible 2. Robert Bergh 3. George Lieb

Scale Event—1. Corp. A. Maynard 2. B. Brock 3. F. Lashek

Beauty Event—1. Art Gray 2. J. Susaynich 3. S. Krynski

Female Flyer—1. Ann Schmidt

Youngest Flyer—1. Fred Schmidt (6 yrs. old)

Combat Event—1. Vincent Bonnena 2. Fran McElwee 3. George Lieb

* *

The Merrill Malley Memorial Meet, sponsored by the Press-Union newspapers at Suicide Bowl Nov. 2, was the largest meet ever held in Atlantic City. Despite the gloomy weather, 6000 spectators turned out for the occasion to honor the memory of Lt. Merrill Malley, a former National record holder in model aviation, who was killed in the European Theater of Operations. Members of the *Sky Blazers' Club* deserve a special commendation for promoting the meet in such

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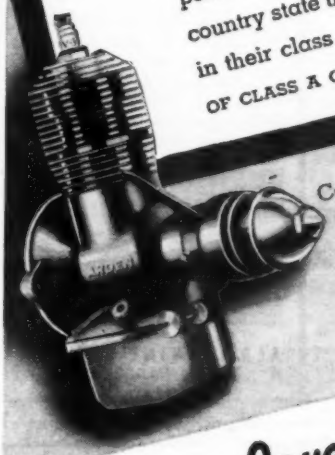

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128.75 mph official AMRCA race car record Bakersfield, Calif., Sept. 27. Set by Ray Vivian.

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128.52 mph AMA official speed at Roanoke, Va., Oct. 6, and **132.30** mph at Burlington, N. C., by Harold Bunting's airplane Jet job.

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a professional manner. Joseph Bligh, who served on the Publicity Committee, wrote us a detailed letter explaining the strategy used by the members to arouse public interest in the meet and local co-operation of the press, radio, etc. Even the police department participated by roping off the field and stationing patrolmen there. The *Sky Blazers* get our vote for making one of the most outstanding contributions of 1947 in their efforts to interest the public in model aviation. Future activities of this club will be well worth watching. Here are the winners:

Speed

Class A—1. Robert More 2. Robert Ripley 3. James Bevy

Class B—1. William Schaefer 2. John Lessig 3. Harry Cosby

Class C—1. Robert Mastrovich 2. Charles Bates 3. Willard Hartman

Junior Stunt

1. Fay Peoples 2. Robert Lessig 3. Robert McGlade

Senior Stunt

1. Don Roetman 2. Frank Stanton 3. Carrol Ripley

New York

Sponsored by the Junior Activities Committee of Elmira Area Soaring Corp., a glider model contest on Oct. 19 at Harris Hill attracted a large number of boys with their models. Prizes were given for best entries.

* *

Joseph H. Pira, Publicity Director of the *Screamin' Demons* in L. I., is another chap who is dear to the heart of this Club News reporter for keeping her up-to-date on activities out "oyster heaven" way. On Oct. 19 the club entered the A.S.M.-A.E. contest at Teteboro, and the following 5 members placed in this meet: Bill Johnke, Pres., won 1st and Fred Otten 4th in Class B; Joseph Pira was 3d and Charles Munder placed 5th in Class C; Bill Davey was 5th in Class A. The club has a point system which is rather unique and seems to be quite an incentive for the boys to stay "on the beam." Points are accumulated for attending meetings, building new planes, flying on week days and Sundays, and for attending local and distant contests. Each member needs only 4 points per month to keep in good standing in the club. Membership is limited to 25. At present there are only 15 active members and the club is campaigning for 10 more recruits. Hope it won't be necessary to send out a scouting party to hunt for ten extra men!

Pennsylvania

The *Kiwanis Aero Club* held a dinner in the Fountain House, Doylestown, at which the A.M.A. Charter was personally presented by the President of The Academy of Model Aeronautics.

Rhode Island

The *Little Rhody Aero Engineers* is a newly organized model club in Pawtucket. The following officers were elected: Arthur C. Bergeron, Chairman; Norman E. Boily, Vice Chairman; Frank Droby, Sec. Treas. All correspondence should be sent to Frank Droby, 49 Gooding St., Pawtucket. There is a junior division consisting of boys up to 18 yrs., and a senior division from 18 yrs. and over.

Texas

The International Aviation Celebration, sponsored by Flight Operators, was held Dec. 4 at El Paso.

* *

Perpetuation of American airpower through living "youth" memorials to airmen who were shot down in World War II was proposed by Gold Stars United of American War Dads, Veterans of Foreign Wars, and Army air units. C. R. Mooney,

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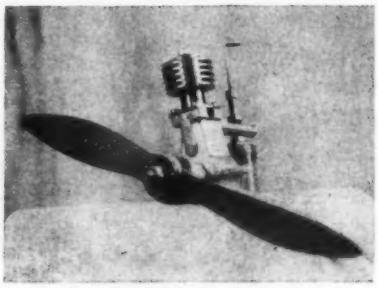

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SPECIFICATIONS

The DEEZIL is a single cylinder, Class A compression-ignition internal combustion engine. Its specifications are:

Bore	.473 in.
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Displacement	.125 cu. in.
RPM	8000
Weight	.5 oz.
Overall Height	3.5 in.
Mounting	Beam
Prop (U-Control)	8 x 10
Prop (Free Flight)	10 in.
Fuel	Deezilmix
Compression Ratio	Variable to Infinity
Rotation	Clockwise and Counterclockwise
Running Position	Upright or Inverted
Controls	Needle Valve and Compression Lever

Each DEEZIL is a jewel of machining perfection, carefully assembled and thoroughly tested. The cylinder, pistons, crankshaft and connecting rod are made of special analysis steel, and the crankcase is of die cast aluminum. EACH CYLINDER IS INDIVIDUALLY FITTED TO ITS PISTONS.

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Put your DEEZIL in any Class A or small Class B free flight plane. Forget about ignition and starting troubles and put in a full day's flying. For contest work, use the DEEZIL Shut-Off Valve. Use your DEEZIL upright or inverted, or as a pusher.

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Power any Class A or small Class B, U-Control plane with your DEEZIL and watch the prizes roll in. Easy starting and simple adjustment to maximum power make the DEEZIL the perfect U-Control engine.

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The DEEZIL will revolutionize small race car operation. Easy installation, elimination of ignition, split second starting and high torque power output is the dream of every racing fiend, and DEEZIL gives you all this and more.

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The bugaboo of powered boating is gone when you use the DEEZIL because the DEEZIL RUNS COOL. Forget about special vents and flywheel fans—the DEEZIL will pull that racing boat at high speeds until the last drop of fuel is gone. Flywheels and all boat accessories are available.

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DEEZIL RUNS STEADILY

The roar of the DEEZIL is steady all the way to the last drop of fuel. It's so smooth that you can hold the DEEZIL in your hand while it's running! Send your ship up knowing that the DEEZIL will run, run, run and keep running.

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Use genuine DEEZIL accessories to get the most out of your DEEZIL:

DEEZILPROP (Free Flight)	$0.50
DEEZILPROP (U-Control)	.50
DEEZILMIX Fuel	1.00
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DEEZIL Vibro-Tak (to measure RPM)	2.00
DEEZIL Flywheel (for boat or car)	1.25
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DEEZIL Gear Set (for race cars)	3.00
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DEEZIL Spinner	1.25
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DEEZIL Control Wire	.75
DEEZIL Wrench	.15
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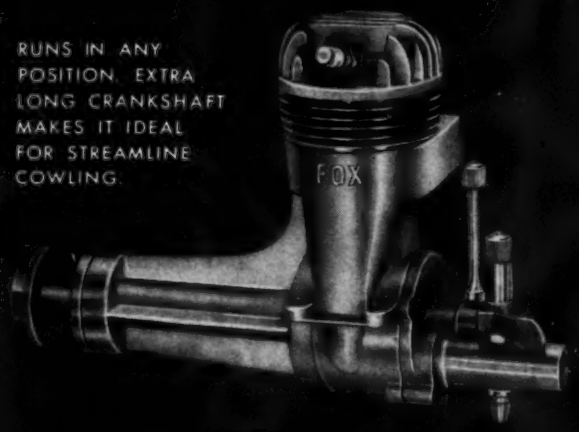

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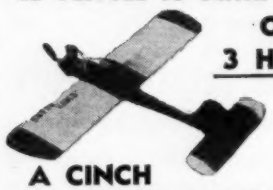

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national sec. for the Gold Star Dads association, authorized the V.F.W. of Jackson County, Mo. to name a boys' model aviation club in memory of his son, Lt. Robert H. Mooney, who died in air battle over China in 1942. "There could be no higher tribute paid to an airman who died for his country than to attach his name to a unit of eager youths developing their natural aptitudes as airmen," said Mooney. Mr. Mooney plans, through the first "memorial" club to be set up in his son's honor in Kansas City, to establish a "laboratory" for expanded model activity. Col. Robert Scott, famed fighter pilot and author of "God Is My Co-Pilot," under whose command Lt. Mooney fought his last air duel, recommended the living memorial idea to Brig. Gen. L. Victor Beau, commanding general of Civil Air Patrol. C.A.P. units have been alerted to offer technical guidance for boys' clubs and to establish a series of model plane contests throughout the nation, culminating in a national championship meet to be held in Washington next summer. The V.F.W. officials reported that the organization's national model program is spreading like brush fire.

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Design Forum

(*Continued from page 21*)

In the old days this interest would bring a model builder into a lot of trouble and crashes because an ordinary gas model was a comparatively large airplane and expensive to build. However, Mr. Rowe has discovered that simple, inexpensive planes may be powered and flown with the new carbon dioxide engines. Also, these little planes are similar in design to their big brother gas models. The same proportions and rules apply even in respect to centers of weight and area. In fact, they are miniature gas models. Because of their simplicity and low cost, it brings experimentation with miniature aircraft within the reach of thousands of model builders who otherwise could not afford it.

Mr. Rowe says he is laying out a design for one of these little CO-2 jobs and is much interested in the percentages given in our December "Design Forum." However, he explains, these proportions apply to tractor planes. He wishes to know if they also apply to pushers because his latest design is of this type.

Pusher models have many advantages, and for some unknown reason have been sadly neglected. Basically, their proportions should be the same as a tractor, the only difference in design being that the nose of the fuselage is slightly longer. Fig. 1 shows the proportions of a pusher model. You will note that instead of the nose-length end being 33% of the tail moment arm M, it is 38% of M. This is an approximate minimum. Actually, this length depends on how far forward the batteries and coil of a gas model or the capsule of a CO-2 engine have to be placed in order to bring the center of gravity, C.G. on the drawing, into the correct position. Your airplane should balance in a horizontal position when suspended at C.G. This should be located at the center of the wing or slightly to the rear.

In some cases where the thrust line is very high, the C.G. may be located at the trailing edge; the lower this thrust line relative to the wing centersection the more forward the C.G. should be. C.G. in the average pusher will be located as shown in the drawing. If the tail is made light and is supported at the end of very light booms, then weights of batteries, coil, or capsule will not necessarily be located far forward of the wing leading edge. In other words, if the tail is made very light, these weights may be placed closer to the C.G. with a comparatively short nose (N) resulting.

A short nose and concentrated weights are advantageous because they contribute greatly to the airplane's stability. A lighter structure also results, because the closer together the heavy weights are located, the lighter the tail and nose structure can be built.

In the old days pushers were not uncommon at contests. Usually they were of the low wing type because it was more convenient from a structural standpoint to build them this way. However, low wings usually are superior in speed but inferior in climb, compared to high wing or parasol types. The alignment of forces in a low wing tends to give the airplane a flight attitude in which the wing angle of attack approximates zero while the tail is flying at a negative angle. This arrangement is necessary when the thrust line is high in order to provide proper flight attitudes in power-on and power-off flight.

In a low wing, if the wing is given an

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3/32x3/16	2c	3/16x2	14c
3/32x1/4	2½c	1/4x2	16c
3/32x3/8	3c	5/16x2	18c
3/32x1/2	3½c	3/8x2	20c
1/8 sq. 3 for	5c	1/2x2	22c
1/8x1/4	2½c	1/32x3	10c
1/8x3/8	3½c	1/16x3	12c
1/8x1/2	4c	3/32x3	15c
5/32 sq.	1½c	1/8x3	19c
3/16 sq.	2c	3/16x3	22c
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3/16x3/8	4c	3/8x3	30c
3/16x1/2	5c	1/2x3	35c
3/16x5/8	6c		
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1/4x3/8	4c		
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angle of incidence of 2° or 3° and the stabilizer is set at zero, and then the whole arrangement adjusted for a normal flight, the plane will stall when the power cuts off. To provide a proper climbing angle and assumption of the proper gliding angle when power ceases, it is imperative to place the wing at zero or 1 degree angle of incidence. The stabilizer in any case should be given an angle of incidence of 2° or 3° less than the wing. In Fig. 1 we show a 3° wing angle of incidence and zero on the stabilizer. This is the correct setting for a high wing or parasol wing pusher, just as it is correct for tractors of these types.

If the fuselage carrying the motor rests on the top of your wing, it is in effect a low wing and the wing angle of incidence should then be from zero to 1° positive. The stabilizer, if it is positively cambered as in Fig. 1, should be set at an angle of 3° less; if the stabilizer is a flat surface top and bottom and not curved, there may be a difference in angle of only 2° between wing and stabilizer.

Pushers are like tractors in respect to location of their centers of weight and lateral area. The same rules apply. The center of lateral area in all cases should not be above a line that passes through the C.G. and parallel to the thrust line. In the model shown here, the lateral area may be lowered considerably by placing the wheels at the lower end of fins extending downward from the beams beneath the wing. These fins serve as landing gear supports, provide area below the C.G., and in effect produce a low center of lateral area. Planes with these downward extending fins are exceptionally steady in flight and do not waste power in unnecessary cavorting all over the sky.

If you have not flown a model with one of these new carbon dioxide engines you have missed a thrill. To begin with, a simple airplane may be used. One that adapts itself most readily to this form of power is the all balsa type. Even the wings are made of balsa. Model builders have usually associated balsa wings with cheap gliders or experimental planes. However, they are particularly adapted to the size of airplane required for carbon dioxide engines and will give contest performance. They have the added advantage of being cheap and easily constructed. If the larger CO-2 engines are used, chord (C) of the wing in Fig. 1 should be approximately 4". If the smaller types are used, C should be about 2-1/2". With these small chords you can see how easily and efficiently a sheet of balsa will serve as a wing.

Fig. 2 shows three types of all balsa wings suitable for CO-2 planes or even for rubber powered models. The first type A, is the most efficient. Here the height of curve H is approximately 1/12 the chord C. It is unnecessary to make it higher as in regular built-up wings. When balsa is used, wing sections may be comparatively thin and of less camber. Note that there is considerable undercamber to all three of the wings shown. This gives buoyancy with comparatively slow flight speed.

Type A is milled or sanded out of a solid sheet of balsa. The sheet should be about 5/16" thick when chord C is 4". The top and bottom surfaces should be shaped to the exact contours indicated in A. The lower surface should sweepback horizontally from the leading edge and then gradually curve up. It should not curve up abruptly from the leading edge. This provides a smooth airflow that is not possible with the type of balsa wing

shown in B. This downward bellying of the lower surface immediately back of the leading edge is called a "Phillips Entry." In A it is not very pronounced, but in some airfoils it is quite large.

Wing B is formed from a single 1/16" thick balsa sheet. It is steamed or moistened and then curved to the exact shape given here. A form should be made so that it is held in shape while drying. To be sure that the wing holds this form, put it in a medium hot oven for a minute or so to bake thoroughly and eliminate all moisture from the fibers. When this is done, the wing will hold its shape much longer and resist atmospheric changes more readily.

This curved sheet, however, is not as efficient as the wing in A. There is a slight turbulence immediately back of the leading edge below the wing. This is caused by the sudden change in the airflow as this sweeps beneath the wing and past the leading edge. At the point indicated by the arrow in B the airflow must turn upward suddenly, thus causing the turbulent effect and some drag. Therefore, it is not as efficient as A because it gives more resistance compared to the lift it generates.

However, the curved balsa sheet type may be made very efficient if a nose block is cemented to the undersurface flush with the leading edge and then shaped as indicated in C. With 4" wing chord this nose block should be approximately 1/8" thick. The uppersurface of the sheet should be sanded down so the leading edge is slightly rounded and the wing uppersurface presents a smooth unbroken curve. The lower forward edge of the block and part of its rearward undersurface should be sanded away as indicated, to give the undersurface the proper contour. With this type of wing you have a combination of construction simplicity with efficiency. If you have ever seen a bird's wing you will note how similar it is to this wing section in respect to contour.

The dihedral of a pusher wing is the same as in tractors. In the type in Fig. 1 the center portion of the wing between the tail booms may be horizontal, the dihedral of each wingtip starting outside of the boom. Wingtips should be raised approximately 1/12 the span above the wing center point as in tractors. These little planes, powered with CO-2 engines, are bound to give great impetus to experimentation with models of various types because of low construction cost, ease of building and less chance of damage while flying.

* *

We might call this "Returning Veterans Month" because we have received so many letters from model builders who have returned or are about to return from service. In this group is Anthony Chesek, Jr. who says: "I will soon be able to get back to real modeling again—that is, free flight. These past two years I have built and flown control line planes exclusively for the simple reason that I had neither time nor facilities for working on any other type. Now that the time of my discharge is drawing close, I have been occupying my time with the designing of a super free flight plane. Since I am a bit rusty on free flight fundamentals, I am submitting my results to 'Design Forum' for criticism before drawing up full size plans."

Mr. Chesek's model is shown in Fig. 3. He says it will be powered with a .65 engine using an extension shaft to the propeller. The particular aerodynamic

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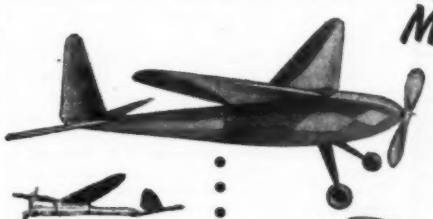

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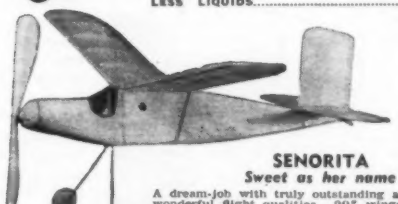

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features are a gull wing and lateral area disposed so that the center of lateral area is on a horizontal line with the C.G. as shown in Fig. 3. This provides rolling stability—that is, the plane under these conditions will resist any tendency to excessive banking, and practically eliminates the dangerous spiral dives so common to many designs.

Mr. Chesek's design is very pleasing to the eye and is also aerodynamically correct. It should not only be stable but highly efficient. However, we do not see the necessity of using an extension shaft on the motor; in fact, keeping the motor in its present position and mounting the propeller directly on the shaft shortens the nose. This will make the plane even more stable due to the shorter nose, because the nearer to C.G. the propeller is, the smaller is the gyroscopic moment. This is a tendency of the propeller to swing the tail sideways due to its rapid rotation.

On all airplanes a certain amount of the tail surfaces, both horizontal and vertical, function to overcome this gyroscopic effect of the propeller. Naturally, the less the effect the smaller the tail surfaces may be, resulting in less drag and less weight.

Mr. Chesek wishes to know what wing section we suggest for this type model. Obviously, duration will be maximum if the climb is fast and the glide is flat. So our wing section must give both a fast climb and a slow flat glide. This is a combination that is hard to find because usually a wing section that is fast in climb is fast in the glide. However, in our December issue we gave a wing section, the G-10, shown in Fig. 1. This section gives both a reasonably fast climb and a very flat glide and has been thoroughly tested over a period of years. A similar section, the Grant X-8, at one time held most of the records in this country and at present is used on many contest radio controlled ships. The section shown, according to tests made in Germany, gives a lift-drag ratio of approximately 26, which is very high. This is the measure of the gliding angle.

The gull wing supplies a graceful and pleasing appearance but is not necessarily an aerodynamic advantage. Fig. 4 shows a front view of the gull wing arrangement. You will note that the section of the wing close to the body slants sharply down and intersects the body at about 90°. This same effect from a strength and aerodynamic standpoint may be attained by using a single vertical pylon connecting the wing and body; the pylon is similar to many present day ships. The pylon gives slightly more drag where it intersects the wing, but on the other hand it will give less drag where it intersects the fuselage; also, it presents only one vertical surface to forward motion while the gull wing provides two.

An excellent form of dihedral is shown in Fig. 4 with correct proportions and angles. In the figure, S represents the span, so the inner portion is 1/3 the span and the outer tip 1/6 the span.

* *

We have a letter from Louis Pess of Brooklyn, N.Y. who wishes to know if he can design an airplane shaped like a sea gull. This is very indefinite. We could give a more positive answer if he would roughly sketch his conception of this airplane. If an airplane is designed exactly like a sea gull, with a very short tail moment arm and no vertical fin, it will not fly. However, if the tail surfaces are placed far enough from the wing and the

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		2"	No. 14 .07	2"	No. 26 .10
7½"	.25	2½"	No. 15 .08	2½"	No. 27 .15
8"	.30	3¼"	No. 16 .10	4"	No. 28 .20
10"	.35	4"	No. 17 .12	4½"	No. 29 .25
		4½"	No. 18 .15	5"	No. 30 .30

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3/32"	.12	4½"	No. 3 .22	5"	No. 9 .35
⅛"	.12	5"	No. 4 .25	5⅞"	No. 10 .35
		5⅝"	No. 5 .30	ADD 3c EACH FOR MAILING	
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wings constructed similar to the sea gull, it should fly provided other aerodynamic factors are correct.

In average models of the rubber type, the tail area should be 33% to 35% of wing area; in gas models the stabilizer area should be as small as 25%, though more is often advisable because of increased stability. The fin area of a gas model should be 5% to 7%. When the nose is short the fin may be small. Rubber models require at least 10%. Often fins on rubber models are made with 12% of wing area. This depends on propeller size and nose length. When these two factors are large, the fin area must be large, sometimes as much as 16% of wing area.

We hope other model builders will send in their ideas and contribute to the pleasure and information of "Design Forum" readers. Address: c/o MODEL AIRPLANE NEWS, 551 5th Ave., New York 17, N.Y.

Improving CO-2 Performance

(*Continued from page* 32)

by expansion. We do not say or imply that the cartridge should be heated above normal temperatures. On the contrary, never apply heat to the cartridge under any circumstances; because of the high pressures involved this could be extremely dangerous.

A simple method of supplying heat to replace that lost by expansion is shown in the diagram accompanying this article. It is based on the fact that even a tiny quantity of water at room temperature contains a relatively large amount of heat energy. Total weight of the installation is less than an ounce, and the increase in performance is well worth the added weight.

Form the cartridge holder from sheet acetate, cemented up to form a tube 4" long and 1" in diameter. Seal up one end with a disk of the same material and make a cap to fit over the top of the metal cartridge holder to prevent sloshing in flight. The acetate tube is mounted permanently in the model and filled one-third full of tepid water before inserting the cartridge holder.

The installation shown on the model in the photograph has proven ideal, since the diagonal come-apart of the nose section permits new cartridges to be inserted without bending the feed line. Rubberbands hold the nose in place for flying. It has been found from experience that there is little chance of the water spilling since even a fairly shallow bank will provide enough centrifugal force to keep it in place.

With the setup shown the writer gets an 80 second motor run. This, of course, can be varied by adjusting the cylinder to suit the weight of the model in which the installation is used. The actual improvement in performance may be judged from the accompanying table showing length of engine runs at various settings, with and without the heat exchanger.

RESULT OF TEST

Test No.	*Eng. Setting*	*Act. Dur.*
1	.50	80 sec.
2	.40	70 sec.
3	22.5	33 sec.
4	.30	67 sec.*
5	.49	72 sec.

Ten *Sparklet* bulbs were used for the test. The left hand column shows re-

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1/32 ....5 for 10c 3/16 ....2 for 10c
1/20 ....5 for 10c 1/4 ....2 for 10c
1/16 ....3 for 10c 5/16 ....2 for 11c
3/32 ....4 for 10c 3/8 ....6c ea.
1/8 ....3 for 10c 1/2 ....7c ea.

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1/16x1/4....10, 5c
1/16x3/8....8, 5c
1/16x1/2....6, 5c
3/32 sq....12, 5c
3/32x3/16 10, 5c
3/32x1/4....6, 5c
3/32x3/8....5, 5c
3/32x1/2....4, 5c
1/8x1/8•....12, 5c
1/8x3/16•....10, 5c
1/8x1/4•....6, 5c
1/8x3/8•....5, 5c
1/8x1/2•....4, 5c
1/8x1....2, 5c
3/32 sq.•....5, 5c
3/16 sq.•....5, 5c
3/16x1/4•....4, 5c
3/16x3/8•....3, 5c
3/16x3/4•....9, 5c
1/16x3/4•....3, 5c
1/16x1•....3, 5c
3/16x1•....3c ea.
1/4x1/4•....4, 5c
1/4x3/8•....3, 5c
1/4x1/2•....2, 5c
1/4x3/4•....2, 5c
1/4x1•....4c ea.
3/16 sq.•....2, 5c
3/16x3/4•....3c ea.
3/8x1/2•....4c ea.
3/8x3/4•....5c ea.
1/2x3/4•....6c ea.
1/2x1•....7c ea.
1/2x5/8•....7c ea.
3/4x3/4•....8c ea.
3/4x1•....9c ea.

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1 1/2 sq..15 2x3....50 3x4....1.25
1x2....20 2x4....60 3x6....1.65
1x3....25 4x4....80 4x6....2.25

6" x 36" BALSA
1/16"..40c | 3/16"..70c | 1/4"..90c
3/32"..50c | 1/4"..80c | 3/8"..95c
1/8"..60c | 3/8"..90c | 1"..1.00

NOSE BLOCKS
1x2x1 — 2c
1x2x2 — 2 for 5c
1x2x6 — 5c
1x3x3 — 4c
1x3x6 — 7c
2x2x3 — 5c
2x3x3 — 5c
2x3x3 — 7c
2x2x6 — 10c
2x3x6 — 10c
2x4x4 — 10c
2x4x6 — 15c
3x3x3 — 10c
3x3x6 — 15c
3x4x4 — 15c
3x4x6 — 20c
4x4x4 — 20c
4x4x6 — 25c

PROP BLOCKS
1/2x3/4x5 — 2c
1/2x2x6 — 3c
5/8x1x8 — 3c
3/4x11/4x10 — 3c
1/2x11/4x12 — 4c
1x11/2x12 — 7c
1x11/2x15 — 9c
1 1/2 sq.x16 — 12c
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10"- 9c 45c 50c
11"- 10c 45c 50c
12"- x 45c 50c
13"- x 45c 50c
14"- 12c 50c 55c
15"- 15c xx xx
16"- 90c 90c
18"- 1.00 1.00
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2"- 2c X 15c
2 1/2"- 3c 15c 20c
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3 1/2"- 10c 20c X
4"- 15c 30c 30c
5"- 20c 50c X

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Sandpaper, 4, 5c
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1/32or1/16 .8cft.
3/32or1/8 10cft.
3/16or1/4 30cft.
SHEET ALUM.
.003-.005 20cft.
.010 ..... 25cft.
1/16x3x12 30cft.
ALUM. ANGLE
1/8x1/8x12" 25c
3/4x3/4x12" 35c
ALUM. FOIL
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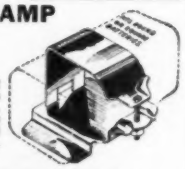

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sults of various settings under normal conditions; the right with the cartridge immersed in water (temp. 80F). Air temp. 80F. A lower air temperature would have shown a greater advantage for the water immersion setup. Test seems to indicate that CO-2 charge may vary from cartridge to cartridge, particularly the fluke results of test No. 4 (*). These figures are believed to be due to either an underfilled cartridge on the normal run or an overfilled one on the water immersion test. Cartridges leak a certain amount after being filled, some of course leaking more than others, which would account for the discrepancies noted even though the ten cartridges all came from the same box.

For the purpose of the test the engine was removed from the plane and mounted on a test block. A tumbler of water was substituted for the acetate tank in the plane since many previous runs had shown that the quantity of water used (above a minimum covered by the tank in the article) has no effect on duration.

Hot water should not be used since this may soften the sealing composition in the neck of the holder.

Plane on the Cover

(*Continued from page* 17)

cooled engine. After accumulating enough time in the Davis to make it dance at his touch, Chester headed for Cleveland and the 1931 National Air Races where he drove the little speedster to 3rd place in three races, netting $200, $120 and $160, a not-to-be-sneezed-at sum in the rumblings of the approaching depression.

The following year Chester rang up one of his all-too-few 1st places by winning the Sohio Mystery Derby and $235 in his little Davis monoplane. He added in sundry 2nd and 4th places to run his earnings up to $280 for the meet, expenses plus a little change and a conviction that his own design was the answer to the big winnings in air racing.

The following year Art Chester's name zoomed into the headlines and he established himself beyond all question as a permanent threat to all air race contenders in his engine power class. For it was the International Air Races in Chicago in 1933 that saw Chester click off the winnings: first $360; third $270; second $500; first $360; third $270; first $360; race after race, win after win until Art Chester had rung up $3935 in winnings during the event—and that wasn't a bad year's salary in 1933, the bottom of the depression.

From that year on Chester was as much a part of air racing as high prices for cheap hamburgers. In 1933 in Los Angeles he collected $680 for one 1st, three 4ths and a special sweepstake award. In 1934 back in Cleveland he rung up his register to the tune of $2055; in 1935 he won a Greve Trophy and $3920; in 1936 again in Los Angeles he collected three 2nd places and a 3rd to collect $3440; in 1937 he rung up $2525 with 2ds and 3ds plus an added $2900 for two 2ds and two 3ds at the Pacific International Air Races, all these with his famed *Jeep* racer.

Then came his *Goon* speedster and the big time. He collected $5000 for 2d place in the 1938 Greve Trophy Race, and in 1939 Chester belied his "bridesmaid" title and romped home at 263.39 mph to win $9000 and the Greve Trophy. And he was well on his way to a high place in the grinding Thompson Trophy Race when he pulled out in the 17th lap. Then came the war—

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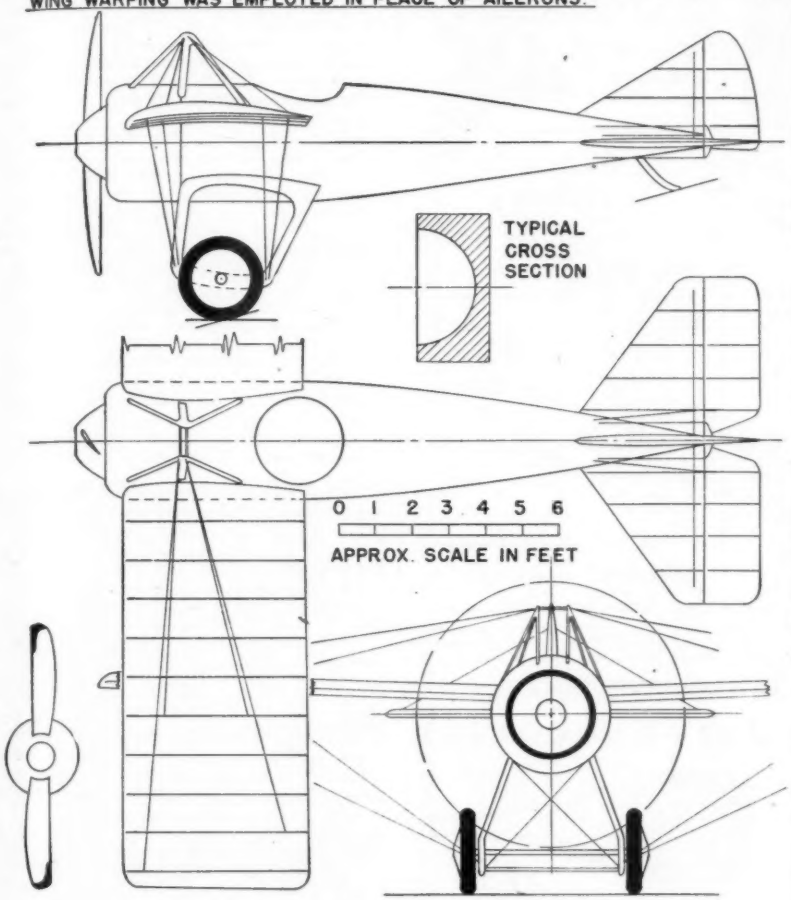

Wittman

With his racing days over for a while, Chester turned to his designing skill and as a North American Aviation engineer he played an instrumental role in the layout of the trim NA-35 trainer in which compact cockpit arrangement and neat powerplant installations were products of Chester's racing experience. Then came his own company manufacturing propeller spinner assemblies for numerous combat aircraft.

But throughout the war Chester pondered on a growing conviction: postwar racing was going to prove a brutal holiday unless safety rules were brought into the picture. Race after race, before the war, Chester had seen his friends pile in, most of them with only injuries but far too many, few as they were, sacrifices to the sport. What was needed was rules of strength, rules of safety and, more important, rules of pilot competence. Thus was formed the Professional Race Pilot's Association in Chester's Los Angeles living room.

Chester and his fellow race pilots laid down complete requirements for a new category of racing planes with the same rigid specifications required of licensed commercial aircraft. Approved by NAA, which must license all racing pilots and sanction all races if official records are to be promulgated, these regulations created a new era in air race history.

Briefly, these regulations require the airplane to have an engine of less than 190 cu. in. which carries a CAA Approved Type Certificate, and which cannot be "souped up" except in accordance with manufacturers approval, thereby making the improvements available to all. These go a long way towards eliminating engine failure as a hazard. Propellers must have fixed pitch, fuel tanks must carry at least 15 gals., and fuel injection equipment may be carried if desired.

The airplane itself must have a wing loading of not more than 12 lbs. per sq. ft., eliminating completely the "hot rods" of pre-war days when "another coupla feet" were sawed off wingtips when extra speed was required. The plane cannot weigh less than 500 lbs. (eliminating fragile construction), and materials and workmanship must conform to regular aircraft standards.

The pilot must perform a flight test before the Technical Committee of the Association, consisting of a full throttle takeoff (during which the plane does not veer more than 30 ft. to either side of a line down the runway); pull up from level flight to a minimum 6-G acceleration (proving the wings capable of "taking it"); dive to at least 1.3 times the maximum level flight speed of the airplane; make three tight turns of 120° at 5000 ft. at full speed to simulate a pylon

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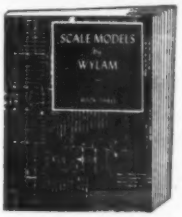

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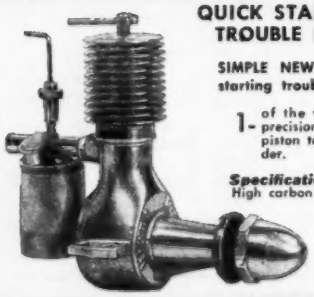

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turn; and actually fly three laps of an established race course at full speed to demonstrate the strength, stability and capability of the airplane. The pilot must have at least 2 hours of time in the airplane, at least 500 hours of solo time in any type of airplane, and must have made at least 5 takeoffs and landings of the racing plane within 90 days before the race.

While assisting with the creation of these rules, Chester was also spending his evenings and weekends at home designing his own version of the new, "safe" racing plane. He chose, first, the "butterfly" tail because it uses less total area than the conventional tail, therefore has less drag. His powerplant installation, always his specialty, proved unique with air being taken in through a circular inlet in the propeller spinner. Inside this spinner is a fan which forces the air on to the engine. In addition, the exhaust stacks exit from special outlets along each wing root providing a jet effect, the combination of blowing and sucking producing adequate cooling for the tightly cowled engine with a minimum of drag-producing scoops.

The fuselage is of welded steel tubing with wooden fairing strips fabric covered. The wing is of wooden construction fabric covered. Span is only 18 ft. 6 in., and *Swee Pea* is 15 ft. 7 in. long. It weighs 590 lbs. empty and 880 lbs. fully loaded. It has been clocked at 196 mph, certainly not bad for an 85 hp Continental engine!

But after 20 years of flying, 10 of them in the grueling competition of the National Air Races, and a brand new racing plane of his own design ready to go after the cash of the new Goodyear Trophy event, Chester announced he wasn't flying in the 1947 National Air Races—the first time in 18 years the name of Art Chester failed to appear on the pilot's roster.

Instead he chose tiny Paul Penrose, who flies big Douglas DC-4's for Western Air Lines. But again Art Chester's name appeared in the "bridesmaid" column, though opposite it stood total winnings of $4,850 for the numerous heats of the Goodyear Trophy Race. But second out of a field of 12 is graphic indication of the standing of Art Chester in the air race fraternity.

Next event is the All-American Air Maneuvers at Miami January 9-11, which will be history as you read this. But with $10,000 waiting for the winner of the Continental Motors event, in which Professional Race Pilots Association rules will apply, you can bet Chester's *Swee Pea* will be there and fighting for the winner's circle.

Will Art Chester be in the cockpit at a racing meet again. "I don't think so," he told this writer. "Give the younger fellows a chance."

"Will your *Swee Pea* win?" we asked. "Sure," grinned Art Chester, "at least a third . . maybe a second!" he adds with all the relish that the world's most famed "place and show" air race pilot can muster!

Radio Control Data By Experts

THE March issue of MODEL AIRPLANE NEWS will feature a story by the famous Good brothers—Walt and Bill (several times National R. C. winners)—who will give some hints on Radio Control flying of interest to both beginner and experienced flyers. Don't miss this March issue of M.A.N.!

LAMINATED PROPS

By Ray Rusher

MOST modelers take pride in enhancing the appearance of their model planes —and one trick to accomplish this is to provide it with a *laminated prop*, as illustrated in drawings 1 and 2. These are no more difficult to carve than the mono-wood type and can be carved with a greater degree of accuracy.

Contrasting colors of wood are used, such as walnut or other dark wood alternated with mahogany, pine, maple or other light wood. Rip the wood into strips 3/32" to 5/32" thick and slightly wider than the prop to be carved. Use a "combination" circle saw in this operation and you will obtain surfaces suitable for being glued together without further treatment. Glue the required number of strips together under pressure to provide a prop blank of the necessary thickness or depth, using a good grade of glue. *Casco* or *Cascamite* is recommended. After 48 hours, remove the pressure and let the blanks dry at least a week before carving the props.

The method of carving is the same as for the usual propeller. First rip the laminated prop blank to the width and depth dimensions there specified. Then cross-slot the blank and cut to outline shape. Drawing 2 is a suitable shape. After the prop is carved and sanded, balance and varnish it, and the result should have the appearance of drawings 1 and 2.

With reference to the greater degree of accuracy during carving mentioned above, this is secured by being careful to carve the prop blades so that the parting lines between laminae curve smoothly instead of being irregular or wavy. Drawing 2 shows a dotted line which indicates that the cut would be too deep if the adjacent parting line were carved to it instead of being as shown.

Laminated props are adapted for the 4 blade type described in January 1947 issue of M.A.N. The spinners there described can also be of laminated construction as shown in drawings 3 to 10 and will have a very distinctive appearance. The forms of drawings 3 and 7 are relatively simple, whereas the spinner of drawing 6 is more complicated though the best looking of the three in the estimation of most modelers. Drawing 3 is a front view and 4 a side view of a spinner laminated by gluing a stack of disks together and then turning the spinner to its final shape on a lathe.

Drawing 5 is a side view and 6 a rear view of a spinner laminated by gluing radially arranged wedge shaped laminae together. Drawing 7 is a front view and 8 a side view of one having laminae extending parallel to the axis of rotation. Drawing 9 is a plan view of 8, and 10 is a crossection

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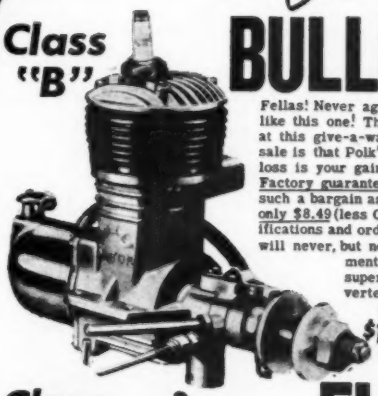

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GMCO NOTES

VOLUME 3, NO. 3 — FEB. 1948

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1/16 x 1/2	.2c
3/32 x 3/32	6...5c
3/32 x 3/16	.1c
3/32 x 1/4	3...5c
3/32 x 3/8	.2c
3/32x1/3	..2 1/2c
1/8 x 1/8	4...5c
1/8 x 3/16	3...5c
1/8 x 1/4	2.....5c
1/8 x 3/8	.3c
1/8 x 1/2	.4c
1/8 x 3/4	.5c
1/8 x 1	.6c
3/16x3/16	.4c
3/16 x 1/4	.4c
3/16 x 3/8	.5c
3/16 x 1/2	.6c
3/16 x 3/4	.8c
3/16 x 1	.9c
1/4 x 1/4	.9c
1/4 x 3/8	.5c
1/4 x 1/2	.7c
1/4 x 3/4	.10c
1/4 x 1	.12c
5/16 x 5/16	.5c
5/16 x 3/8	.6c
5/16 x 1/2	.8c
5/16 x 5/8	.9c
5/16 x 1	.12c
3/8 x 3/8	.7c
3/8 x 1/2	.10c
3/8 x 3/4	.12c
1/2 x 1/2	.10c
1/2 x 3/4	.15c
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1/4 x 2	.13c
3/8 x 2	.14c
1/32 x 3	.11c
1/16 x 3	.11c
3/32 x 3	.13c
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TO ORDER
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of 3 and 4 showing also a special crankshaft nut described in the January issue. Drawings 3 to 9 include this nut, too.

While laminated spinners for a large hub 4 blade prop have been illustrated, smaller spinners for the smaller hub type of prop shown at 1 and 2 may be laminated and turned in a similar manner. Planes equipped with laminated props and spinners will be found quite an attraction at any contest or flying field.

"DYE IT - THEN FLY IT"

by Ted Schreiber

FOR all you aeronuts with a love of color, or for you contest-wise experts with an eye on minimum weight, here is a method of coloring models guaranteed to produce the loudest oh's and ah's from admiring spectators. It can be used on Silkspan, bamboo paper, silk or nylon with very little expenditure of time, and at far less cost than any means of color doping. The covering material used loses none of its flexibility or toughness, and the colors are permanent.

In place of coat after endless coat of colored dope, substitute a standard powdered clothing dye. Yes, DYE is the secret of this quick and lightweight method.

Whether you live in the smallest town or the largest city you can walk into the general store or "5 and 10" and select any combination from as many as 24 different colored dyes. You are no longer limited to 6 or 8 varieties of colored dope, so just think of all the novel color schemes you can use on the small scale model or the big gas job you've been planning in the back of your mind.

O. K., now that you have turned the idea over in your thoughts, I will take you through a simple step-by-step procedure.

First, follow your usual methods of construction, making sure that joints are strong and that the structure will stand a thorough soaking.

Finish the entire framework before any portion is covered in order to do the covering and dyeing in complete time-saving operations. Using clear dope liberally, tack the covering to the framework. When the covering is completed, redope the places where the silk or paper touches the wood —this prevents the dye from penetrating and will make all framework stand out in its natural finish.

Next, decide on the most suitable color combinations for your particular model and purchase the dyes of your choice. They usually come in powdered or cake form for approximately 10c a package. ("Tintex Clothing Dye" was used in all my experiments). Directions on the package explain the preparation of the dye.

Now, in using your own method of water doping, substitute the dye solution for the clear water you would normally apply. Allow the dye to remain on the covering until the color is deep enough for your satisfaction. Then wash the excess dye solution off with clear water and your coloring job is completed. Allow the covering to dry and follow through with enough coats of clear dope to keep it wrinkle-free.

Here are a few extra hints that may help you do a more perfect job.

Be careful not to splash the dope on the paper or silk before dyeing. The dope prevents the dye from penetrating and will cause a spotty coloring job.

Apply the dye solution warm for deeper, clearer color.

Covering may be applied wet after it has been dipped into the dye solution.

ONE WORD OF CAUTION—For the sake of family happiness be careful not to spatter the dye around your workroom. Once on the floor or furniture it is there to stay. *Yes, it is permanent.*

After you have become familiar with this dyeing technique you will be able to evolve many unusual combinations of coloring, and to combine dye with trimmings of colored dope. Let your imagination wander, for that is the basis for the advancement of model aeronautics.

Screamer

(*Continued from page 19*)

the amount produced by the wing taper, it will be found most convenient to build the wing upside down with the flat top of the spar against the workbench. Cement the 1/8" flat ribs in place and add the leading and trailing edges. Wingtips are made from scrap balsa blocks, the right tip having aluminum tubing guides for the control leadouts imbedded in it. Plank the wing on top and bottom with 3/32" sheet balsa and carefully sand to finished airfoil shape.

The bellcrank is formed from 1/16" dural and fastened to the center of the spar. Note from the fuselage side view that the bellcrank is bent on each side to bring the ends down opposite the holes in the wing ribs through which the .032 spring steel leadouts pass. Care should be taken with these parts, since they must support in accordance with AMA requirements a 20 G pull test. If they are not anchored firmly you will end up with the insides of the plane outside upon the first processing of your ship.

The stabilizer is also of laminated construction with a 1/16" plywood center and 1/16" balsa outside plies. A 1/16" wire piece imbedded in the elevators hooks them together. The horn for the control rod is cemented to this wire. Hinges are the conventional cloth over-under variety.

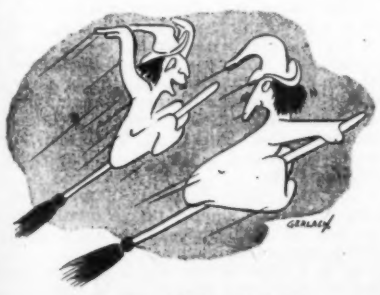
Notch the top fuselage shell for the wing spar and stabilizer and cement them securely in place. Add the 1/16" wire control rod and an aluminum fairlead to prevent it from buckling. Fillet the wing to the fuselage with scrap balsa.

The fuselage halves are held together with a bicycle spoke end cemented to the wing spar and running through the bottom shell, and by a bolt and nut at the tail end of the fuselage.

The entire ship was covered with nylon and given several coats of clear dope before color doping. To protect the finish from being dissolved by hot fuels, it is recommended that the entire ship, inside and out, be varnished with Testor's finish sealer or similar hot fuel proofer.

The dolly is made from 1/8" spring steel wire. Use large free-running pneumatic wheels, and make certain it does not have a tendency to turn toward the center of the circle. Rubber tubing over the wire at points where the plane rests prevents the finish from being nicked.

About the only thing that can be said about test flying is to be calm, deliberate and avoid overcontrolling. One of the most frequent mistakes made by beginners to speed flying is to overcontrol on the takeoff, whereupon the ship does a snap loop right off the dolly and is promptly decimated. Do not try flights with the motor throttled—clipped wing speedsters should always be flown wide



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Signed (Name on request)

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NOW READY! Smith X-L (extra large) Race Car Condenser . . . **50c**

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it's HOT!
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Fits Standard Pint Can
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Tiger
SUPER GLO-FUEL
FOR ENGINE OPERATION WITHOUT IGNITION

Manufacturers' recommended fuel. Use Tiger Super-Glo-Fuel (A) with glo-plugs. Start engine with 1½ volt battery. When engine runs remove battery for ignitionless, diesel-like operation. **Pints 75c.**

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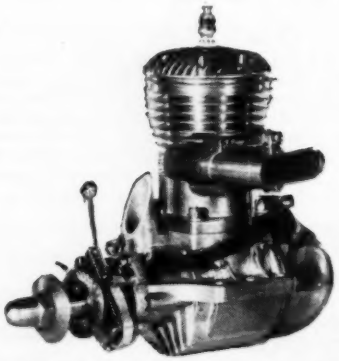

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$24.95

Less Coil and Condenser (Includes plastic gas tank for free flight)

ANDERSON Spitfire

SPITFIRE SPECIFICATIONS

TYPE—Two port, two stroke cycle, air cooled.
FUEL ADMISSION—Through ball bearing mounted rotary crankshaft valve.
CARBURETOR—Tangent down-draft. Spray bar suction type.
BORE—15/16". STROKE—⅞". COMPRESSION RATIO—6:1.
PISTON DISPLACEMENT—.604 cu. in. or 10 cubic centimeters.

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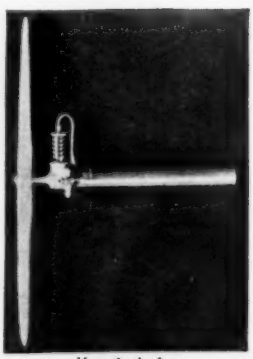

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open. Training flights should be made with a trainer type.

When the motor cuts, don't allow the ship to drop in like a brick. Stay with it, whip like mad and don't stop until you have it worked down to an altitude where you can let it slide in on its belly skid without cartwheeling. You can really be satisfied with your landing technique when you can shoot 10 straight without a broken prop or flip over.

One more suggestion: Take a good clear photo of your plane and send it in to "Air Ways," where it will receive the recognition a good job of workmanship deserves.

Gismoe

(Continued from page 9)

high strength-weight ratio. The ribs are cut from 1/8" medium sheet balsa and sanded. Build the two main centersections first by pinning the main spar of 1/4" x 3/4" very hard balsa, and 1/4" x 7/8" very hard balsa trailing edge in their respective positions, as shown on the plans. Now cement the ribs in their places and cement the 1/4" square very hard balsa leading edge onto the ribs. The auxiliary top spar of 1/8" x 1/4" medium hard balsa is now cemented to the ribs. While this assembly is drying, construct the two tip sections in exactly the same manner. Join the four sections with correct dihedral angle, as shown on plans. When dry, roughly shape wing, and cement the 1/16" x 3" medium sheet balsa to the leading edge. The 1/16" x 1/4" cap strips are now cemented to their positions on the upper side of the ribs. After regluing all joints, sand and shape wing to a fine finish.

EMPENNAGE—The tail is constructed of a 1/4" medium sheet balsa outline, with rear triangular bracing for antiwarp qualities. Little need be said about constructing the tail because it is clearly explained by the plans. Build strong, light, and sand well.

FINISHING—After all the components are finely sanded your model is ready for covering. Wing and tail surfaces should be covered with heavy type G-M Silkspan, and at least 5 coats of clear dope should be applied after shrinking with water. Color dope is not recommended for these surfaces. For best results, fuselage should be covered with silk or nylon. After shrinking, at least 7 coats of clear dope and 2 of colored dope should be applied. This will make the fuselage almost impervious to gas, oil, weather and the ravages of time. 10/0 sand paper should be applied between each coat of dope. Remember, a good finish always is a sign of a good model builder!

FLYING—For test flying, transport your model to a large level field—devoid of trees, houses and nuisances. (If you have one of these fields available, please let the author know—postage will be paid!)

Preliminary test glides should be made on a calm evening, and incidence applied on the elevator if required. The original model did not require any incidence. About 2° of left thrust and 6° of down thrust were used in the engine; combined with wash-in on the left wing. The rudder was set at 0-0. This produced a fast left spiral climb and a very slow, flat right circling glide.

The first flight should be at very low power. Power should be gradually increased on each succeeding flight until the maximum is reached.

With a little moxey and favorable flying weather your model should accumulate many trophies—Good Luck!

Wakefield Models

(*Continued from page 15*)

LANDING GEARS—Most popular is the fixed-type gear of 1/16" wire, formed in one piece and mounted by means of a "sandwich," which is glued in place between the appropriate crosspieces. One wheelers, with deep rudders, or sub-rudders to provide three-point contact with the ground, are fairly popular. Such a landing gear features a single wire strut shaped at the fuselage end to fit through a metal tube and form a hook for the rubberband that snaps the wheel up, and back, when the ship becomes aidborne. Since a Wakefield model must take off unassisted, it is recommended that the two-wheel type of gear be used in preference to either the single wheel fixed or retracting type, especially when the possibility of wind is considered. (Gas modelers solve design difficulties like this by changing the rules!) By all means use a light wheel that is either well streamlined in the British fashion or made of 1/16" plywood with hardwood "buttons" for bearings. A 1-3/4" diameter is sufficient.

PROPELLERS—The two-bladed folder is used most often. However, there is a wide difference of opinion on prop design. Builders like George Reich in this country, and Bob Copland, maintain that the free-wheeler is best. It is certainly most reliable, has nothing to malfunction, and cannot affect either trim or glide adjustment by folding. Copland argues that it is virtually impossible to aerodynamically balance the one-blader, and that the resulting vibration wastes power. Typical prop blocks run from 16" to 18" diameter and are cut from blocks about 1-3/4" thick and 2-1/4" wide. Ed Naudzius, former Moffett winner, used a block (for an 18" diameter one-blader) of 8" x 1-5/8" x 2". Roy Nelder, Canadian Moffett winner, used one 8" x 1-7/8" x 2-1/8"; Henry Cole had a two-blader cut from a block 17" x 1-5/8" x 2-1/2"; Jim Cahill's one blader measured (18" diameter) 10" x 1-3/4" x 2-1/4". In any case, a good sturdy tensioning device is essential. The rubber motor is usually more than twice as long as the distance between hooks. Various widths of rubber are favored: Cole used a 96" long 10 strand motor of 3/16" flat rubber, which he doubled over for a 20 strand of 48" length; Cahill an 18 strand, 49" long motor of 1/4" flat; Nelder a 44" of 28 strands 1/8" flat. In general it is believed that wider strands give more power, and narrower strands more turns. Recent trends are toward slightly less power.

WINGS AND TAILS—The most common wing is the old one- or two-spar variation, although many builders go in for the Cleveland multispar construction exemplified by Korda and Lanzo. High aspect ratios of 8 and 10 to 1 are prevalent. Spans run 40" or slightly more, and chords from 4-1/2" to 5". A multispar wing may employ as many as 8 spars of 1/16" square balsa. The sheeted leading edge section, so popular on gas models, is often dispensed with. A wing of about 44" span will require 20 or more ribs for an efficient section. Sections vary widely. Earlier trends were toward the somewhat thicker airfoils like the Eiffel 400 and the RAF 32. In the narrower chords, the famed NACA 6409, so thin and undercambered, sometimes proved irksome to construct. During the past year some American builders, in particular a few Chicago experts, have gone in for wings that have sections so thin that they look almost flat. These are flat-bottomed after the fashion of the Clark Y. Such models

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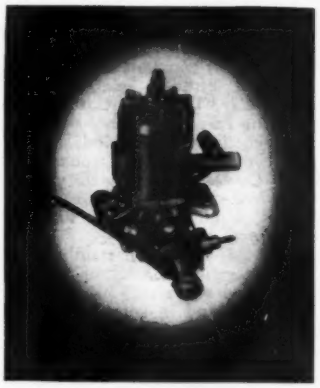

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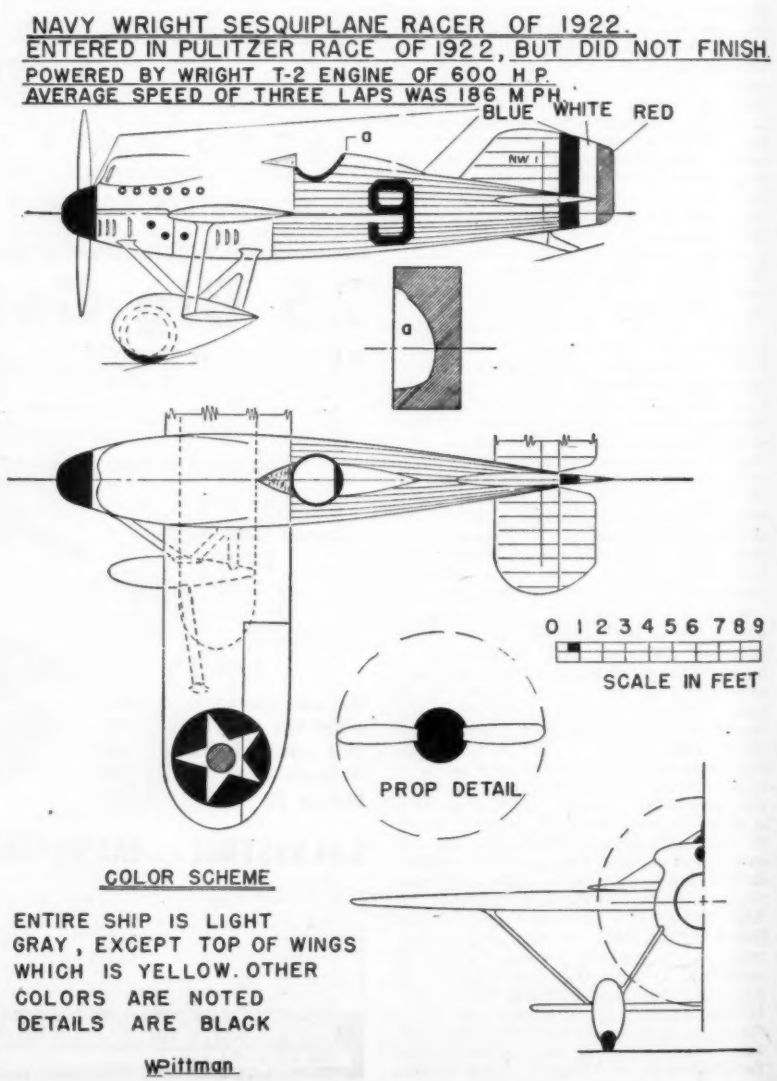
climb very fast and high due to their reduced drag, and it has not been proved that they suffer materially on the glide. Ed Lidgard jokes that it would take them three minutes to fall. Due to the lack of spar depth, spruce spars are used for strength. We recall that Jim Cahill used hollow balsa box spars on the *Clodhopper*. This practice is common in Britain where enterprising builders claim that such spars have 1/3 the weight and from 3 to 9 times the strength of the solid equivalent. Polyhedral is regarded as essential in this country, although some builders, notably *Cole*, do very well without it. Straight vee-dihedral is the rule in other countries. About 2" rise per foot of span is considered adequate.

The typical American stabilizer is of a lifting crossection, the c.g. of the airplane being carried rather far back in relation to the chord and in some cases actually being behind the wing. In the fixed wing position type of model the proper camber of the tail can be ascertained through tests, so it is possible to trim the model without having to change the wing mount. It is surprisingly difficult to design a model with a fixed wing position and then have it balance right off. We know of one expert who has 4 sets of holes for the rear rubber dowel, so that he can get final trim by choosing the best rubber length. Subsequent models of course would take advantage of this experience. The ideal situation is a design that has been developed through 3 or more consecutive ships. Builders like Lidgard claim that a ship so developed can be flown without thrust adjustments, as should any "perfect" rubber design. Some builders prefer symmetrical sections on the grounds that cambered sections increase drag and require more power. Number of spars and basic construction follow wing practice, but there is some trend toward sheet-balsa construction which is claimed to be lighter. Tail assemblies are usually glued in place.

For the majority of builders who may be having a whack at rubber for the first time, the accompanying 3 views and sketches will be a help in preparing for the many *Wakefield* type events that will be held in the future, and perhaps for the eliminations, or even the finals! Given our choice of anything in modeling, we would much prefer to win the *Wakefield* cup, for it is the greatest of all trophies in this modeling world!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AVERAGE SPEED OF THREE LAPS WAS 186 M.P.H.
BLUE
WHITE
RED
NW 1
9
a
a
0 1 2 3 4 5 6 7 8 9
SCALE IN FEET
PROP DETAIL
COLOR SCHEME
ENTIRE SHIP IS LIGHT GRAY, EXCEPT TOP OF WINGS WHICH IS YELLOW. OTHER COLORS ARE NOTED DETAILS ARE BLACK
WPittman

Flash

(*Continued from page 2*)

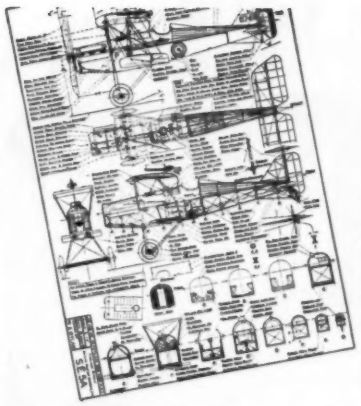
cargo carrier is powered by two 1425 hp Wright *Cyclone* engines, which give it a top speed of 230 mph. Although only two prototypes are being built, Navy wants a production quantity if it can get the money from Congress. Craft stresses a variety of interior layouts with straight cargo, 14 passengers or 16 litters arrangements.

McDONNELL AIRCRAFT has developed one of the most weird craft yet revealed, a ramjet powered helicopter model under Air Force contract. The ramjet engine varies from the familiar turbojet in not having the latter's complex air compressor and turbine. The ramjet is simply a tube into which fuel is metered, with the forward motion and the shape of the duct doing the rest. Advantage of the ramjet helicopter is the location of the thrust out at the blade tips rather than down in the fuselage as in conventional helicopters. This arrangement makes it unnecessary to transmit the power through the hub, thereby saving considerable weight and complexity. McDonnell's contract is only for research on the idea and not for a completed helicopter, thus the odd "flying workstand" appearance of the device. Air Force is mum on its future plans for ramjet helicopters.

NAVY MARTIN XP5M-1 is now under construction at the Baltimore plant of Glenn L. Martin Co. It is a slick-up PBM *Mariner* with a new type hull developed in the towing tanks of NACA, government research agency, at Langley Field, Va. The hull offers both less water and less air resistance. The P5M has the single big vertical tail of the P4M, the floats of the JRM *Mars*, and the wing, powerplants and hull of the PBM. Basically a research airplane, it will test the efficiency of the new hull for rough water operation and highspeed air runs, the latter the classic stumbling block of the flyingboat.

SHOULD A COMPOSITE plane be a "roadable airplane" or a "flyable automobile"? That's the old question bothering proponents of the idea with plenty of examples of both types having been tested since 1904. Consolidated Vultee sticks to the latter but calls it the former—so where are we? At any rate, Convair's new "flycar" is one of the slickest yet developed and illustrates a new approach to the problem: a complete family automobile containing its own engine and modern automobile lines (similar to the Studebaker Champion), to which is attached a complete airplane assembly, the latter also containing its own powerplant, wings, tail and controls. Idea is a minimum of compromise with the automobile as a standard land vehicle. The car is powered by a small Crosley engine located in the rear with the streamlined nose containing a baggage compartment. Introduction of the plane was marred by a bad crash the first week after its flight test, but Convair believes that the crash proved the rugged construction of the car for none of the occupants were seriously injured and the plane will be ready to resume flight shortly. Reason for the crash? You guessed it: ran out'a gas!

WHAT'S WRONG WITH the Douglas DC-6? Nothing that a little rearrangement of accessories won't fix—and very soon. Tragic though the Bryce Canyon disaster was, and near-tragic though the New Mexico emergency might have been, they illustrate only the necessity for a thorough "shake-down" of new aircraft before widespread commercial or military service. The Civil Aeronautics Board has recognized this with its new "100 hr. accelerated service test" requirement on new aircraft (the Martin 2-0-2 completed the first one, the Convair Liner should be finished when you read this), but a new 1000 hr. requirement may go into effect. The DC-6 air conditioning system takes air in from a belly scoop, pumps it up to pressure (to supply the pressurized cabin), then puts it through a heater. A leak in the blower allowed oil to be blown through the heater resulting in a fire. Another possible



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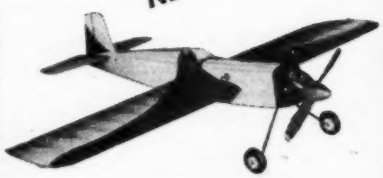

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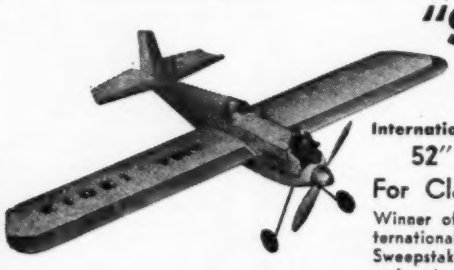

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cause was gasoline draining from wing tanks entering the belly scoop with the resulting entry of the vapor into the heater. Such unpredictable combinations of events are normally only detected after extensive flying time. Tough to discover but easy to fix, they remain the bugaboos of aviation that constantly increasing effort is at work to avoid.

POSSIBILITY THAT THE Russians are manufacturing substantially identical models of Boeing B-29 *Superfortress* has been voiced by no less an expert than Gen. Carl Spaatz, Chief of Staff of the Air Force. Stating that several B-29's fell into the hands of Russia during forced landings in Siberia in the course of raids on Japan (with which Russia was technically neutral) beginning in 1944, Spaatz says that they had more B-29's over Red Square during the last May Day parade than those known to have been interned. He believes Russia could have built 500 to 1000 B-29's since that time. This has shaken the popular belief that although Russia has fighters and low altitude attack planes she has no long range bombers with which to go to war.

CLUE TO PERFORMANCE of the Convair XB-46 four-jet bomber has come with its cross country flight from Muroc Air Base, Calif., testing ground to its new home at Wright Field. First run was a Muroc-Tinker Field, Okla. City flight during which it averaged 507 mph. Capt. Glen W. Edwards, pilot, was surprised at Tinker when told he has established a new multi-engine record for the distance for he had not "pushed" the needle-nose bomber. Evidently he did "push" it on the next lap from Tinker to Wright Field for he chalked up an average speed of 533 mph. While this speed seems obviously well shy of the 650 mark now being bantered about by the *Skystreak*, its an indication of where heavy strategic bombers are getting, speedwise!

LUSCOMBE ANNOUNCED price tag on its new four-place sedan, and enthusiasts can calm down now for it's going to sell for $6,995. Hopes for a reasonable figure were blasted by L. H. P. Klotz when he explained that production costs and the necessity for writing off the development on the first production aircraft would force the figure up to the seven thousand region. Guess we'll all have to keep right on waiting for that $3,500 four-place airplane.

GONE ARE THE DAYS of the "mile-a-minute" climb as a mark to shoot at, for McDonnell says their new big F2H-1 *Banshee* will climb at rate of 9,000 feet per min. after a takeoff. Reciprocating engine record still stands at 10,000 ft. in 100 seconds made by a Grumman F8F *Bearcat* more than a year ago.

THE SUPERSONIC BATTLE between Navy's Douglas D-558-1 and Air Force's Bell XS-1 continues, with the present score giving the edge to the Bell but only by a fraction. Latest dope reveals the *Skystreak* hit Mach number 0.89 (almost 90% of the speed of sound), but the XS-1 reports a high altitude flight reaching Mach number 0.92 with full rocket power. They're edging up, but the going multiplies in difficulty as each point of Mach number is reached. Aerodynamicists like to point out that drag increases as the square of the speed (double the speed and you get *four times* the drag) but, more important, power required increases as the cube of the speed (double the speed and you require *six times* the power)!

WITH THE WHOLE U. S. pulling for him apparently, Howard Hughes pulled his brobdingnagian flying boat aloft for a short one mile hop just in time to beat the Ferguson Committee hearings rechanting their "hasn't even flown" song. But inside sources, who were aboard during the hop, insist that the tail had a gentle but firm oscillation during the flight, which may possibly indicate upcoming trouble when the giant boat flies at higher speeds. But the four year question "Will it fly?" has been answered beyond doubt, and Hughes was vindicated in his faith. What's ahead remains a mystery to all concerned, but the fact remains that a 200-ton airplane *can* be built and flown.

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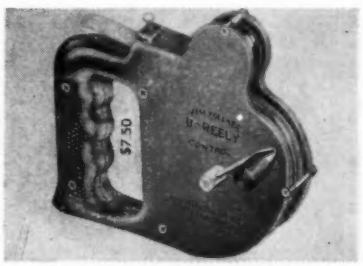

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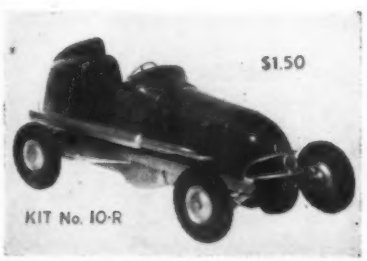

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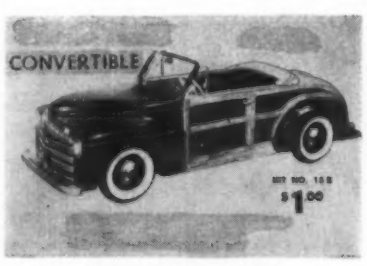

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